Healthy meals at worksite canteens - Social shaping as a framework for understanding sustainable interventions

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Healthy meals at worksite canteens
- social shaping as a framework for understanding sustainable interventions

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Ph.D. thesis

Technical University of Denmark, Department of Management Engineering, 2010

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Preface

The aim of this Ph.D. thesis is to make a contribution to the promotion of healthy eating in the worksite setting. The thesis is completed in co-operation with the Department of Management Engineering (MAN), Section of Innovation and Sustainability and the Department of Nutrition (FOOD), National Food Institute, Technical University of Denmark.

The foundation of this thesis is nutrition, since my educational background is in food science. Furthermore I have an interest in social psychology, sociology and food sociology that I studied in US at the Culinary Institute of America and at Dutchess County Community College in Poughkeepsie, NY.

Through the years I have been working with interventions aiming at promoting healthy eating at worksite canteens and I have noticed that the availability of healthy food is of great importance to health promotion. I have also noticed that the meals available in worksite canteens are not always healthy compared to the nutritional recommendations. I found that the canteen managers and staff at the canteens are experts, not only in preparing the meals but also in knowing the social context of the canteen in relation to the worksite. They are important stakeholders in any health promotion intervention regarding the canteen and in order to sustain the intervention the canteen manager's commitment to change is crucial.

It is my impression that the sustainability of an intervention is often talked about but not often studied. As I previously (from 2000-2002) worked with the promotion of healthy meals in Danish worksite canteens, it made sense for me to return to these canteens to study the mechanisms of sustainability. The idea was to study the 5 year sustainability of a 6 month fruit and vegetables (F&V) intervention in five Danish worksite canteens in order to build up more scientific evidence about planning and embedding of healthier worksite eating. The current thesis presents the outcome of this work.

It is my idea and hope that the combination and presentation of my research will provide the reader with the best possible understanding of the diverse aspects of the sustainability of an intervention.

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I am so grateful to many people for supporting me through this Ph.D. study.

I would especially like to thank my main supervisor Michael Søgaard Jørgensen (MAN, DTU) for being very supportive and enthusiastic about the study. From him I learned always to be modest in my research and towards the people with whom I work. I also want to thank my other advisor Bent Egberg Mikkelsen (Nutrition and Public Food Systems, Aalborg University, former FOOD, DTU) for his support. Their competences lie at the interdisciplinary research combining several areas from food science and environmental science to action research, user innovation and participatory approach

The staff and the canteens managers at the five worksite canteens are sincerely thanked for being cooperative and patient towards the project and my research through the last 10 years since the ''6 a day' -project started in 2000.

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I have enjoyed many good discussions about the project during the writing of my thesis with Eva Høy Engelund and Ida Husby. Also a special thank to Liselotte Schäfer Elinder and Vibeke Bagger for reviewing my thesis.

My very good friend Elizabeth Shieh has been a very patient reader editing my three papers and this thesis and also kept my spirit high and encouraged me to finish my Ph.D.

At last I would like to thank my family, friends and my three children, Christian, Oscar and Victoria for being supportive and around me during this tough period of my life. Finally Thomas is thanked for his support and love.

Holte, April 2010

Anne Vibeke Thorsen

This Ph.D. thesis has been carried out during my employment at the Department of Nutrition, the Technical University. It is part of the project "Meal elements optimizing the quality of distributed meals" a co-operation between the Department of Management Engineering, the Division of Nutrition, National Food Institute, and the Food Production Engineering (former BioCentrum-DTU), all at Technical University of Denmark. The work was financially supported by The Directorate for Food, Fisheries and Agro-Business and by the Department of Management Engineering and the Division of Nutrition, National Food Institute at Technical University of Denmark.

Sammendrag

Den ernæringsmæssige udfordring i forhold til arbejdspladser er at forbedre adgangen til sundere måltider – især for grupper med et lavere uddannelsesniveau. Strategier, som for eksempel at øge tilgængeligheden af sund mad og at nedbryde barrierer for at spise sundt, kan hjælpe brugerne af arbejdspladskantiner til at ændre deres kostvaner i en sundere retning.

Det er en central udfordring at fastholde offentlige sundhedsfremme-tiltag, ikke kun i forhold til arbejdspladser, men inden for sundhedsfremme generelt. Der er kun udført relativt få empiriske studier på dette område. Mange sundhedsinterventioner glemmer at betragte de forskellige arenaer som fx. arbejdspladser og skoler som komplekse systemer, der dynamisk interagerer med centrale aktører, med organisationen og det omgivende samfund.

Erfaringerne med interventioner til fremme af sundere kost på arbejdspladser såvel i Danmark som internationalt er udgangspunktet for denne undersøgelse. De langsigtede resultater af sådanne tiltag er indtil nu kun blevet analyseret i et begrænset omfang. Ydermere har sundhedsfremmetiltag på arbejdspladser kun haft et begrænset fokus på analyser af arbejdets og arbejdsmiljøets betydning for effektiviteten af tiltagene.

På denne baggrund er det overordnede formål med denne Ph.d. afhandling at bidrage til at fremme sund kost på arbejdspladser ved at udvikle en dybere forståelse af den langsigtede effekt af tiltag i arbejdspladskantiner. Afhandlingen analyserer den længerevarende effekt af at øge forbruget af frugt og grønt på fem arbejdspladser. Analysen benytter en kombination af social formning og et arbejdspladspolitisk perspektiv som teoretisk grundlag for at forstå formningen og forankringen af sådanne tiltag. Disse casestudier er kombineret med en spørgeskemaundersøgelse blandt ca. 550 arbejdspladskantiner om blandt andet sundheden i deres udbud af mad.

Målet med denne afhandling var at:

1. Undersøge om måltider i arbejdspladskantiner er sunde og nemt tilgængelige, og hvad indikatorerne er for at arbejdspladskantiner tilbyder sunde måltider.

2. Måle og analysere den langvarige effekt af en intervention med henblik på at øge forbruget af frugt og grønt på arbejdspladskantiner.

3. Identificere og vurdere succesfaktorer for langsigtet effekt af interventioner, der søger at øge forbruget af frugt og grønt på arbejdspladser med kantiner.

Hovedresultaterne af undersøgelsen er:

Kun 12 % af kantinerne blev vurderet til at være overordnet sunde, dvs. de tilbyder sunde valg inden for såvel varmt måltid som smørrebrød og salat. Specielt arbejdspladser med mere end 75 % kvinder tilbød ofte sunde menuer. Størrelsen af arbejdspladsen korrelerer positivt med sandsynligheden for et sundere måltidudbud. Denne undersøgelse antyder ydermere en positiv sammenhæng mellem finansiel støtte til kantinen fra den pågældende arbejdsplads og tilgængelighed af sunde måltidudbud.

Fire ud af fem arbejdspladskantiner var i stand til enten at fastholde deres resultater i form af et øget forbrug af frugt og grønt - eller endda at øge forbruget fra baseline til 5 års opfølgningen - med et gennemsnitligt forøget forbrug på 95 g per kunde/måltid/dag. Én af de fem kantiner kunne ikke opretholde tiltaget og gik næsten tilbage til dens udgangspunkt (baseline). I gennemsnit havde de fem kantiner ved 5 års opfølgningen et frugt og grønt-forbrug på 208 g per kunde/måltid/dag.

Analyserne viser, at flere faktorer er vigtige for fastholdelse af frugt og grønt tiltag på arbejdspladser. Udlicitering kan være en udfordring for at fastholde sundhedsfremme-tiltag, men det kan også være en måde hvorpå en arbejdsplads sikrer de nødvendige kompetencer for et madudbud med mere frugt og grønt. Strukturelle ændringer af arbejdspladsen, herunder omstrukturering, kan også være en udfordring for den langsigtede effekt, hvis dette indebærer hyppige udskiftninger af medarbejdere på arbejdspladsen, og de nye medarbejdere stiller spørgsmålstegn ved kantineudbuddet med højt frugt og grønt indhold. Involvering af kantinelederen og dennes evne til at udvikle strategier til at integrere mere frugt og grønt i udbuddet, og et godt samarbejde med frugt og grønt leverandørerne spiller ligeledes en afgørende rolle for den langsigtede effekt.

Case studierne viser, at arbejdspladskantiner kan være vigtige aktører i udvikling af interventioner med henblik på sundere kostvaner. Spørgeskemaundersøgelsen peger samtidig på behovet for en mere udbredt implementering af strategier for sundere udbud på arbejdspladskantiner. Case studierne viser, at sådanne tiltag skal formes, så de passer til den enkelte arbejdsplads og udformes i tæt samspil med de lokale aktører på arbejdspladsen og f.eks. tager hensyn til de involverede lokale aktørers forestillinger om sundhed og ernæring og sammenhænge med arbejdspladsen og dens arbejdsmiljø. En kombination af en videnskabelig tilgang baseret på social formning og en arbejdspladspolitisk tilgang til at analysere udarbejdelse og forankring af tiltag med henblik på sundere kostvaner på arbejdspladser har vist sig at være værdifuld som støtte til en udformning af tiltag, der passer til arbejdspladsens normer og værdier og gør en langsigtet effekt af tiltagene mere sandsynlig.

Summary

The challenge of public health nutrition in relation to worksite settings is to improve access to healthier meal options – especially for the groups with a lower educational level. Strategies changing the dietary environment such as increasing the availability of healthy food and reducing barriers towards healthy eating may help consumers change dietary behavior and meet the guidelines for a healthy diet.

The sustainability of interventions is found to be a central challenge in public health promotion not only related to the worksite setting, but in health promotion in general. Relatively few empirical studies are published in this area. Many health interventions fail to consider the interventions as complex systems that interact dynamically with the key stakeholders and the setting and the broader community.

The experiences regarding healthy eating interventions in Denmark and internationally are the point of departure of this research. The long term sustainability of these interventions has up till now only been analyzed to a limited extent. Furthermore health promotions at worksites have only had a limited focus on analyses of the organizational context's significance for the efficiency of the interventions.

Based on this background the overall purpose of this Ph. D. thesis is to make a contribution to promote healthy eating in worksite settings by developing a deeper understanding of the sustainability of healthy food interventions at worksite canteens. This thesis therefore analyses the 5 year sustainability of an F&V intervention at five worksites and uses a combination of social shaping and a worksites policy process perspective as a framework for understanding sustainable interventions.

The aims of this thesis were to:

1. Investigate if the meals served in the worksite canteens are healthy and easily available and what are the predictors of worksite canteens providing healthy meals.

2. Measure and analyze the sustained effect of a fruit and vegetable (F&V) promotion intervention in a worksite canteen setting.

3. Evaluate the success factors concerning sustainability of a worksite F&V promotion intervention.

The main findings of this research were as follows:

Only 12% of the canteens applied to the healthy group combining hot meal, sandwich and salad. Worksites with more than 75% female employees served healthy menus on a frequent basis. The size of the worksite was positively correlated with healthier meal options. Furthermore, this study suggests a positive relationship between corporate financial support and the availability of healthy meal options.

Four out of five worksite canteens were able to either maintain the F&V intervention or even increase the F&V consumption from baseline to the 5 year follow-up with an average of 95 g per customer/meal/day. One canteen didn't sustain the intervention and almost went back to the baseline. On average the five canteens at the 5 year follow-up had an average F&V consumption of 208 g per customer/meal/day.

The analyses show a number of themes are important to sustainability of F&V worksite interventions. Contracting out the food service may challenge the sustainability but may also be a way of ensuring the necessary competences for a more F&V intensive food supply. Structural changes of the worksite, like re-structuring, may also challenge the sustainability if this implies frequent changes of worksite employees and new employees question the F&V intensive food supply. The engagement of the canteen manager and the ability to develop strategies for integration of more F&V in the food supply and good cooperation with the F&V suppliers also play a crucial role.

The results of this thesis point to the need for a more widespread implementation of strategies that promote healthier eating at worksite canteens. The results indicate that a worksite intervention needs to be tailored to the needs of the particular worksite environment in which it is implemented. Furthermore this tailoring needs to be done in close partnership with the local stakeholders. The results also indicate that worksite canteens are important change agents – intermediaries for developing intervention components. Healthier eating interventions are shaped and controlled by the involved local actors' ideas of health and nutrition and also by their concepts of how these ideas interrelate with the worksite's working conditions and working performance. A combination of a social shaping approach and a worksite policy process approach to the shaping and embedding of healthy worksite eating interventions is shown to be valuable in supporting a tailor-making of F&V interventions and make long-term sustainability more likely.

1. Introduction

1.1 Background

Poor habits regarding diet and physical activity are the main causes of the development in the increasing prevalence of overweight and obesity in the Nordic countries as well as other regions (Andersen et al, 2005; Ekholm & Kjøller, 2005; Nordic Council of Ministers, 2006; WHO, 2007). Worldwide, the incidence of obesity has increased over the last 30-40 years and so has the incidence of nutrition related diseases such as diabetes type 2 and coronary heart diseases. According to WHO, the obesity epidemic is one of the most serious threats to public health, and worldwide there are now more people overweight than underweight (WHO, 2003a). Together with a high intake of dietary fat, a low intake of fruit and vegetables was among the 10 top selected risk factors for global mortality (WHO, 2003a).

Population groups of lower social economic status have the highest rate of obesity in the European regions as well as in other industrialized countries (WHO, 2007). A prime driver of the obesity epidemic is believed to be an "obesogenic environment" (Elinder & Jansson 2008) characterized by an increasing availability of energy-dense and nutrient-poor foods and sweetened beverages (Drewnowski & Darmon, 2005; James 2007) in combination with barriers to physical activity (Swinburn & Egger, 2002). Obesity is causally linked to diabetes type 2, cardiovascular diseases and certain forms of cancer (Ezzati et al, 2002).

One strategy to prevent obesity is to improve access to healthier foods in settings such as e.g. worksites, neighborhoods and schools (Drewnowski & Darmon, 2005; James 2007; Whitelaw et al, 2001) – especially for the groups with a lower educational level (Groth et al, 2001). Environmental strategies such as increasing the availability of healthy food and reducing barriers towards healthy eating may help consumers change dietary behavior and meet the guidelines for a healthy diet. The settings approach to promoting healthy eating has been growing in importance ever since the Ottawa charter for health promotion was adopted in 1986 (Pomerleau et al, 2005; WHO, 1986; Whitelaw et al, 2001). The worksite is a unique setting since the worksite reaches a large proportion of the adult population including those unlikely to engage in a preventive health behavior program (Story et al, 2008; Drewnowski & Darmon, 2005; European Commision, 2005; Pomerleau et al, 2005; Eurodiet, 2000; Wanjek, 2005).

Worksite canteens supply meals for a regular clientele and in many cases the lunch meal may constitute the main meal of the day. Seen from the worksite perspective the protection of human health through health promoting activities offers obvious advantages. Worksite dining facilities have undergone significant development, apparently due to increased corporate interest in this issue and due to a new function and meaning of the worksite canteen. According to Horwitz design and

catering arrangements in the worksite have evolved in tandem over the last years to explicitly support the current culture of multitasking (Horwitz, 2002).

Several policy papers including the WHO 2nd Nutrition Action Plan 2007, the EU White Paper 2007 and the Istanbul charter 2006 call for action to be taken in the workplace eating environment (EURODIET, 2000; European Commission, 2007 (White paper); WHO, 2006; WHO, 2007). However these policy documents are not very detailed when it comes to pointing out how the interventions are to be carried out, nor do they relate to what role structural factors such as the type and organization of the worksite might play (Mikkelsen, 2004; Moskowitz et al, 2001). The governmental initiatives around healthier worksite eating have focused on developing policy documents, printed materials for inspiration, guidelines, training, and funding of intervention projects. Most governmental initiatives have involved a number of different stakeholders. The stakeholders include governmental authorities and agencies, research institutes, health organizations and trade unions. The experiences so far from other areas, like "public green procurement", indicate that a policy in itself may not change the practice of an organization (Mikkelsen, 2004).

There is a need to study the role that organizational context plays for the potential of worksite intervention to make a difference in healthier worksite eating habits and what factors are important in order to sustain the changes over the long term.

1.2 Research focus and research questions

Based on this background the overall purpose of this Ph. D. thesis is to make a contribution to promote healthier eating in worksite settings by developing a deeper understanding of the sustainability of healthy food interventions at worksite canteens by analyzing the intervention on a combination of a social shaping perspective and a worksite policy process perspective (Bijker 1995; Olsen & Clausen, 1994; Kamp et al, 2005).

Three papers are included in the thesis. These papers form the main thread in my understanding and research in the field together with this report, where I summarize the research and discuss the methodologies and the findings across the three papers in order to answer my overall research question:

How to plan and sustain healthier worksite eating interventions?

Each of the three papers relate to a sub-question within the overall research question. In the following I present the three papers and their research questions.

Paper 1 and research question 1

The aim of the first paper is to support or refute my observations about the meals available at the canteens: Are they as healthy as the guidelines recommend? Another aim of this work is to identify predictors of worksite canteens providing healthy meals. The survey gives a general view on the healthiness of the meals available at the worksites canteens in Denmark in 2003.

The research question of Paper 1 is: Are the meals served in the worksite canteens healthy and easily available and what are the predictors of worksite canteens providing healthier meals?

Paper 1 is based on a questionnaire survey that investigates the availability of healthy Danish canteen meals by analyzing a self-administered questionnaire mailed to 1967 randomly chosen canteen managers, selected among available records from the database of the Canteen Managers Association (3799 members) in 2003. The questionnaire focuses on the nutritional quality of the menus available at the canteens. Two different health groups (healthy and less healthy) are defined based on the Nordic Nutrition Recommendations (NNR, 2004) and on the Dietary Guidelines (Astrup et al, 2005). The menus are evaluated and categorized into the two health groups depending on the relative quality of the menu options. Furthermore the characteristics of the worksites are compared with regard to the two different health groups in order to analyze whether there are characteristics of worksites serving healthier meals, which could serve as predictors and maybe focus in planning interventions aiming at developing healthier worksite canteen menu options.

Paper 2 and research question 2

The second paper provides the numbers and facts of the analysis of a study of the 5 year sustainability of a canteen intervention aiming at increasing the F&V consumption. The F&V consumption (g/meal/day per customer) from five worksite canteens were measured 5 years after the intervention started and compared to the F&V consumption at baseline, end-point, and 4 months after the intervention ended (1 year follow-up). From these results it is possible to document the effects of F&V interventions in various canteen settings.

The research question of Paper 2 is: Is it possible to sustain the effect of a fruit and vegetable (F&V) promotion intervention in a worksite canteen setting?

In the second paper the F&V consumption is measured in a 5 year follow-up study of an F&V intervention in five worksite canteens. These quantitative measurements are the basis for my research to answer this question.

Paper 3 and research question 3

The third paper includes an analysis from a social shaping perspective and worksite policy process perspective on the original F&V intervention and the 5 year sustainability of this intervention. The method applied in the intervention was based on a participatory and an empowering approach, self-monitoring the F&V consumption in the canteens and networking among the canteens managers and the canteen staff. The analysis of semi-structured interviews, which were carried out as part of the 5 year sustainability study, presents different participants' experiences of the intervention and its sustainability in the five worksite canteens. This paper provides insight into the co-shaping of the F&V intervention and the organization in which the intervention takes place.

The research question of Paper 3 is: What are the success-factors concerning sustainability of a worksite F&V promotion intervention?

In the third paper the F&V intervention and the sustainability of the intervention is analyzed based on a combination of a social shaping perspective and a worksite policy process perspective (Bijker 1995; Olsen & Clausen, 1994; Kamp et al, 2005). These analyses are important to find the success factors related to sustaining an F&V intervention and to understand why some healthy eating interventions are sustained better than others. The focus of the third paper is on the co-shaping of the F&V intervention and the worksite where the intervention takes place.

1.3 Outline of the thesis

This thesis is divided into seven chapters and one appendix.

The first chapter is an introduction to the background of the research topic and the three research questions of the thesis.

The second chapter is an introduction to healthy eating research at the worksite setting both seen from an international as from a Danish perspective.

The third chapter presents the theoretical frame of my research, including the theories of sustainability of an intervention, the social shaping of political programs in organizations and social constitution as concept for understanding worksite policy processes

The fourth chapter presents the methodology of the work conducted in the thesis. The following methods are presented: case study research (Paper 2 and 3), a questionnaire survey (Paper 1), a technique to monitor the F&V consumption (Paper 2) and finally the qualitative research interview (Paper 3).

The fifth chapter presents the results from the three papers.

The sixth chapter discusses the findings of the three manuscripts and the research questions.

The seventh chapter presents the conclusion and the perspectives of my work and proposes recommendations for future worksite interventions with focus on worksite eating and its interaction with worksite organization and working conditions.

Paper I: Workforce gender, company size and corporate financial support are predictors of availability of healthy meals in Danish worksite canteens.

Paper II: Long term sustainability of a worksite canteen intervention of serving more fruit and vegetables.

Paper III: Strategies to promote healthier eating at worksites – analysis of experiences from a social shaping perspective.

Appendix A contains the interview guide to worksite employees and canteen managers in the case studies analysed in Paper 3.

2. Healthy eating at worksites

2.1 International perspective

A systematic review of 13 worksite health promotion programs showed that relatively few of such programs contain changes in the social and physical environment (Engbergs et al, 2005). Although only few studies are available, the evidence base seems large enough to demonstrate that diet can be influenced by altering the range of foods available at the worksite, through a focus on F&V as well as reduced fat content of meals (Engbers et al 2005). A recent systematic review of 16 studies on worksite health promotion interventions on employee's diet supported that worksite interventions in general had a positive, but small, effect on dietary behavior (Mhurchu et al, 2010). Most of the health promotion studies focused on individual responsibility by using educational and behavior change strategies. Some of the studies focused on changing the physical environment in order to make healthy choices easier, but have failed to tackle the economic, political and socio-cultural aspects of the worksite and have (Mhurchu et al, 2010). The survey concludes that well-designed studies are needed in order to integrate quantitative and qualitative research methods to better evaluate reasons for success or failure of such complex interventions.

An international review of studies that had sought to increase the consumption of F&V through interventions at worksites (Sorensen et al, 2004) pointed out that the success of such initiatives seemed to depend on several factors: management support, supporting education and information, supporting organizational structures, employee participation in the planning process and implementation, focus on various risk-/success factors, the incorporation of the employees' social context in the form of, for instance, family and local community.

Several studies have looked at the possibility of increasing the sale of healthy meals in canteens among others places by labeling the food. However, the success of these means has been limited (Butriss et al, 2004). Experience seems to point out that the entire range of food in the canteen, as a starting point, has to be healthy and delicious to ensure a substantial effect on intake.

An older literature review dating from 1999 including 110 health promotion programs at worksites (Harden et al, 1999) showed that only about 25 % of these programs focused on the employees' needs and wishes and had some kind of employee-management partnership. The study also showed that most of these programs aimed at changing individual behavior with limited organizational support. Harden et al (1999) pointed out that health promotion intervention at worksites is rarely evidence-based. Furthermore the discussion in the literature of the significance of different organizational conditions for the effectiveness of an effort is very limited.

A comparative investigation of two intervention studies at worksites and with a focus on smoking and catering among others showed greater effect in the study that also focused on the work-

environment at the worksite (Hunt et al, 2005). Factors of importance in the work-environment comprised a dialogue with management, safety-leaders and employee-representatives among others and with an analysis of risks in the work-environment through so-called "walk-through". The success was presumably due to the fact that priority was given to the concept of "risk" which also included unhealthy eating and smoking.

A Dutch controlled trial study of two public white collar worksites showed no effect in changing the actual fat and F&V intake but a moderate effect in changing behavioral determinants towards eating less fat. (Engbers et al, 2006). The modest environmental intervention consisted of product information to facilitate healthier food choices (Engbers et al, 2005).

The Seattle 5 a day worksite study incorporated employee advisory boards and based the intervention strategy on an ecological framework combining interventions both for individual and the worksite environment (Beresford et al, 2001). Twenty-eight worksites with canteens were randomized to intervention and minimal intervention control group. The aim of the study was to obtain a daily intake of 500 grams of F&V per person at 14 intervention worksites. F&V intake increased in average by 0.3 daily serving after two years compared to the control group. The intervention consisted of changes in the canteens' food service and on the individual employee's behavior. The authors suggested that the increase in the intake of F&V in the control-group could have been caused by a general increased attention on the health effects of F&V in society at the time of the intervention (Beresford et al, 2001). The Seattle 5 a day study also had a family intervention part adding a family component to the standard worksite intervention (Sorensen et al, 1999). The worksite-plus-family intervention showed the greatest increase in F&V intake; 0.5 daily serving indicating that dietary patterns are influenced by the social context (Sorensen et al, 1999, Sorensen et al, 2004).

A Dutch intervention study at two supermarkets and two worksite-canteens showed limited results on the purchase of healthy food (Steinhus et al, 2004). The intervention consisted of providing a greater range of healthy products and display of information in the form of labeling healthy products, brochures and a self-help guide. The limited effect was explained by not being specific enough in its messages by distinguishing better between different products. The range of healthier products was furthermore assessed to be too limited (Steinhus et al, 2004).

2.2 Danish perspective

A survey of Danish literature about worksite eating was carried out as a part of the project 'Food at work around the clock?' carried by Lunds University and Technical University of Denmark and financed by Øresund Food Network (Jørgensen et al, 2009). The focus of the survey was on the

relations between work and diet and the experiences with promotion of healthier eating through intervention projects at worksites. The overall results of the literature survey showed that there is not much Danish research about the influence of the work and the work environment on dietary habits, including worksite eating. The few studies related to this topic are not directly focusing on eating habits but on body weight and long-term stress, where the employees lacked influence and control over their own work could cause health problems and changes in body weight, so that slim persons became slimmer and the obese became more obese (Siggard et al, 1996; Hannerz et al, 2004; Overgaard et al, 2004; Overgaard et al, 2006).

A qualitative in-depth interview study of 20 people between 20 to 60 years showed that the type and the organization of work influenced how the worksite eating is organized. Especially in the service sector was it difficult for the employees to eat at the same time every day or together if the worksite was small. The eating schedule was negotiated among the employees according to the needs of the individual employee (Kristensen, 2003).

Several Danish studies show social inequalities in relation to work and health (occupational health and safety) and in relation to dietary habits. A survey showed social inequalities in relation to health, like in many other countries (Burr et al, 2003; Bøggild et al, 2001). Work environment research indicates that more problems at the worksite are managed within the human resource (HR) field rather than in the work environment field, which could imply a more individualistic approach to worksite health and health in general, where lifestyle is seen as a free and individual choice (Kamp 2007).

A national dietary survey showed that people with higher education eat healthier and are more interested in healthy food. Research also showed a correlation between diet and other aspects of lifestyle: If a person had healthy dietary habits it was more likely that the person also had a high level of physical activity, did not smoke and did not have a high consumption of alcohol (Groth & Fagt, 2003; Groth et al, 2009a; Groth et al, 2009b).

The National Board of Health did a survey on health promotion activities at Danish worksites in 1997, 2002, 2005 and in 2007. An increasing number of Danish worksites have some kind of health promotion activities, including provision of water, healthier meal options, bread with high fiber content, fruit supply scheme etc. The recent survey showed that 60% of the worksites had some kind of food supply for the employees, e.g. 33% of the worksites had a food scheme like a canteen and 48% had a fruit scheme (National Board of Health, 2008). The target group was worksites with more than 10 employees, public as well as private and semi-public. In general the meal options in the canteens have increased since the 2005 survey. The surveys showed large inequalities with respect to health promotion at the worksites in relation to branch and geographic region. Within the finance sector 53% of the worksites had a food supply scheme, while only 7% within the construction sector have some kind of food supply to the employees.

Meal patterns in Denmark are based on adults having their lunch at the worksite around noon and normally consist of one or more of the following dishes: cold open sandwiches, hot dishes, salads fruit, snacks and cakes. The service delivery system at the canteen is either a buffet system, where a variety of food choices are offered at a fixed price or a cash (an á la carte) system with a separate price for each item on the menu. Over the last 10-year period a significant change in the food service systems is seen as the canteens move towards a buffet system.

A Danish survey from 1996 indicated that worksites with more than 50 employees are more likely to have a canteen (Bech & Mikkelsen, 1996). The canteens are typically small. Around 75% of the canteens had less than 5 employees. A more recent Danish questionnaire survey with 553 respondents showed that 70% of the canteens had a buffet serving system and 48% a cash system (only, or in combination with a buffet system). 23% of the canteens had a nutrition policy. An average worksite canteen had 4.2 employees and served on a daily basis meal to 160 customers (Thorsen et al, 2010). According to the survey around 25 % of the participating canteens were outsourced and run by an external caterer (Thorsen unpublished). Over the last 10 years a significant change was seen in the employee profiles at the canteen; more skilled employees (cooks, catering assistants) and fewer unskilled employees. Also the majority of the worksites subsidized the canteens (staff, inventory, food products or a combination) in the 2003 survey only 11 % was not subsidized. Especially salaries and inventories are subsidized. We have no knowledge to what extent the canteens are being financially subsidized by the worksites (Thorsen et al, not published).

A Danish study evaluating the nutritional composition of worksite canteen lunches showed that the serving system can significantly affect the eating pattern of the customers. Eating at canteens serving buffet style was associated with an increased intake of fruit and vegetables for both genders compared with eating at canteens with a cash system (Lassen et al 2007b).

A substantial part of the Danish experiences within worksite eating are based on worksite intervention projects aiming at making the food supply healthier. The Danish '6 a day' project and the Food at Work project have achieved greater awareness about healthy food and also an average increase in the consumption of F&V. However, the long-term sustainability of the increased F&V intake among the employees is not known (Lassen et al 2004; Lassen et al, 2007a). The food at Work intervention study moreover showed that, under given conditions, employees at blue-collar worksites in general have a positive attitude towards the worksite promoting and implementing healthy eating at the worksites, and that the degree of the positive attitude can be increased over the project period (Lassen 2005; Lassen et al, 2007a).

3. Theoretical frame

3.1 Sustainability of an intervention

The sustainability of interventions is found to be a central challenge in public health promotion not only related to the worksite setting, but in health promotion in general (European Commission, 2005; Wanjek, 2005; Pomerleau et al, 2005; Swerissen & Crisp, 2004; O'Loughlin et al, 1998; Pluye et al, 2004). Relatively few empirical studies are published in this area (EURODIET, 2000; O'Loughlin, 1998; Pluye et al, 2004; Sheirer, 2005). Many health interventions fail to consider the interventions as complex systems that interact dynamically with the key stakeholders and the setting and/or the broader community (Shediac-Rizkallah, et al, 1998, Swerissen et al, 2004, Gruen et al, 2008, Story et al, 2008).

Public health promotion is defined as the science and art of promoting health, preventing diseases, and prolonging life through the organized efforts of society (WHO, 1998). The Ottawa charter declares that health promotion is the process of enabling people to increase control over their health and its determinants, and thereby improve their health (Ottawa, 1986).

Several models are available on the basis of which to develop public health intervention programs, for instance Intervention mapping (Bartholomew et al 2006), RE-AIM model (Glasgow et al, 1999) and the Precede-Proceed framework (Green & Kreuter, 2005).

An important challenge for public health practitioners is to ensure that effective health promotion programs are maintained in the community for a length of time sufficient to achieve stated goals such as influencing individual behaviors, modifying the environment and changing public policy. (O'Loughlin et al, 1998). There is evidence from the literature reflecting on more critical ideas and action to help make health promotion more sustainable by targeting the interventions to the specific settings (Dooris, 2006; Shediac-Rizkallah & Bone, 1998; Swerissen & Crisp, 2004, Whitelaw et al, 2001).

Sustainability alternatively referred to as institutionalization, durability or long-term maintenance refers to the extent to which a new program becomes embedded or integrated into the normal operations of an organization (O'Loughlin et al, 1998). Sheirer (2005) defines a sustained program as a set of durable activities and resources aimed at program-related activities. Institutionalization is defined as a fit between the organization and the intervention. Organizations adopt programs that are consistent with their values and norms (Sheirer, 2005).

O'Loughlin and colleagues (1998) investigated the sustainability of health promotion interventions in qualitative case-studies, investigating factors related to the perceived sustainability of 189 heart health promotion interventions in Canada. They identified four variables independently associated

with perceived sustainability; 1) staff involvement in decision making concerning the program 2) modification of the program during implementation, 3) fit of the program to the organization's values and norms, and 4) the presence of a program champion.

A review of program sustainability of 19 empirical studies of health-related programs in the US and Canada summarizes the factors contributing to greater sustainability (Scheirer, 2005). Three definitions for sustainability were measured; continued program activities, continued measured benefits or outcomes for new clients and maintained community capacity. The factors found to be important in influencing the extent of sustainability were if 1) a program can be modified over time, 2) a champion is present, 3) a program fits with its organization's mission and procedure, 4) benefits to staff members and/or clients are readily perceived and 5) stakeholders in other organizations provide support (Sheirer, 2005).

When viewing the history, theory and practice of setting based health promotion Dooris finds a relatively poorly developed evidence base of effectiveness (2005). The settings are viewed as dynamic open systems and the setting approach to promote public health understands health to be determined by a complex interplay of environmental, organizational and personal factors. The paper identifies three challenges relating to the construction of an evidence base for health promotion: The diversity of conceptual understandings, real-life practice and the complexity of evaluating ecological whole system approaches (Dooris, 2005).

Shediac-Ri-Rizkallah and Bone (1998) have made conceptual frameworks for sustainable community-based health programs. Planning requires an understanding of the concept of sustainability and operational indicators. First, 1) Maintenance of health benefits, 2) level of institutionalization 3) measures of capacity building. Second, planning for sustainability requires approaches and strategies that favor long-term program maintenance. Three major groups of factors that influence sustainability: 1) Project design and implementations factors, 2) factors within the organizational setting, and 3) factors in the broader community environment.

Others have suggested that substantial participation in program development and implementation by key stakeholders will lead to higher perceived program ownership and increased sustainability. (Gruen et al, 2008, Sorensen et al, 2004). In an international review of interventions aimed at increasing the F&V consumption through interventions at worksites shows that that the impact is depending on: Management support, information and training, supporting organisational structures, employee participation in planning and implementation, focus on more factors than the diet e.g. worksite health and safety, and involvement of employees' social context, like worksite colleagues and family (Sorensen et al, 2004).

Several of the reviews concerning sustainability of health promotion interventions pointed to at least five factors found to be important in influencing the extent of sustainability; if a program can

be modified over time, a champion is present, a program fits with its organization's mission and procedure, benefits to staff members and/or clients are readily perceived and stakeholders in other organizations provide support (Sheirer, 2005). The finding was supported by O'Loughlin and colleagues (1998) when investigating sustainability of health promotion interventions in qualitative case-studies. Also Lassen et al (2004) suggested similar factors might have influenced the short-term sustainability of the '6 a day' Worksite Canteen Model Study.

The experiences regarding healthy eating interventions in Denmark and internationally are the point of departure of this research. The long term sustainability of these activities has up till now only been analyzed to a limited extent. Furthermore health promotions at worksites have only had a limited focus on analyses of the organizational context's significance for the efficiency of the interventions. This thesis therefore analyses the 5 year sustainability of an F&V intervention at worksites and uses a combination of social shaping and a worksites policy process perspective as a framework for understanding sustainable interventions.

3.2 Method applied at the original '6 a day's intervention study

The original '6 a day' worksite Canteen Model Study investigated the effect of a 6-month intervention on the F&V consumption in five Danish worksite canteens.

In the '6 a day' worksite Canteen Model Study the canteen staff and management in 5 worksites were involved in defining the scope of activities and implementation (Lassen et al, 2004). The canteen staff and management worked closely with the project team. The project used the tools of continuous quality improvement as a background construct, including canteen staff involvement and ownership and problem solving driven by measurable data (Cook & Sinclair, 1997; Robidoux & Sankaran, 1998). Baseline measurements (grams of total fruit and vegetables consumption per lunch meal per customer) were followed by an 8 hour training, goal setting and strategy development by the staff and managers at each canteen. End-point measurements were performed 6 months after the beginning of strategy development and follow-up measurements were performed 1 year from the baseline (4 months from end-point). After the baseline measurements a period of 2 months was spent preparing the F&V intervention, goal setting, deciding on F&V strategies and running courses for the staff. The 6 month intervention was followed by a 4 month period of no F&V measurements before the 1 year follow-up was conducted. Furthermore during the period of intervention achievements at the canteens were shared in short newsletters and the canteen managers were encouraged to network with other canteens managers in order to share ideas and support each other.

The method developed during the ’6 a day’ Worksite Canteen Model Study focused on co-operation between a consultant and the canteen staff and management in defining, planning and implementing the F&V-intervention. The method also focused on providing ideas for increasing F&V for lunch, making environmental changes in the canteens by giving access to tasteful and healthy food choices and reducing the availability of unhealthy options. Lassen et al (2004) believed that some of the key elements for sustaining this tailored intervention were management involvement, empowering the canteen staff, getting everyone in the canteen involved in a proactive way and providing networking opportunities between canteen managers. Furthermore the goals and strategies of the worksites’ interventions were decided individually by each of the canteens’ staff. All staff members participated in monitoring, goal-setting and decision making which increased the commitment to the project.

3.3 Social shaping approach to healthy eating

A dynamic model of change management

In organizational change management a static worksite model is often applied to a planned change, where it is seen as trivial to agree upon goals, and plan, act and finally evaluate the results and compare them to the goals. It is a logical model, and there may be several loops built into the model, giving time for evaluating the results and reacting (Kamp et al, 2005).

The problem with this rather static model is, however, that organizations are very dynamic and are constantly changing as the surrounding society changes. Organizations consist of individuals and groups with different goals and views and therefore changes may be conflicting for the employees involved and for the relations between management and employees. Another and more dynamic view on change management is therefore needed.

Three elements influence the change process (the intervention): a) the concept (measurements and tools), b) the context (the worksite and the surroundings and how it is operating) and c) the stakeholders (internal and external stakeholders e.g. the management, consultants, project leaders, HR professionals, the employees, the change agent).

Three different perspectives on the dynamic change process

The dynamics of change management may be seen from three different perspectives; the learning, the political and the symbolic perspectives. The three perspectives all focus on the process, but they differ in their understanding of the organization and the stakeholders and the role conflicts among stakeholders may play.

In the **learning perspective** the concept is viewed like a concentrated form of knowledge, that is the foundation for the organizational learning process. The focus is on how the organization, the internal context, is working as a learning environment with barriers and possibilities for reflection. Many factors are very important for the learning process of the organization, including how the involved stakeholders adapt to new ideas, and their changed views on goals, measures, and relations. The concept of the learning organization was described by Agyris and Schön in 1978 (Kamp et al, 2005).

In **the political perspective** the concept is viewed like a political program, which means the concept is non-neutral and has a preferred way of viewing the organization's future. Certain stakeholders have particular roles in the change process. The political program is based on a coalition of stakeholders negotiating the change process. During normal operation these coalitions

are stable, but during the change process the coalitions may have to be renegotiated. The keywords in this perspective are stakeholder coalition and negotiation.

The third perspective is the **symbolic perspective** where the concept is viewed as having symbolic values. By getting a new language, new symbols etc. the organization may get a new image and status. Symbols may strengthen the organization from the inside and create identity and image, but they may also change the context as part of a change process.

In this research project the analysis has been applied to understand the shaping and the embedding of healthy eating seen from a political perspective as the main perspective. However, aspects of learning and use of the symbols have also been a focus, but seen as part of a political understanding of organizations. Furthermore, within the tradition of the critical working life research the analysis from the political perspective of organizational context in this research project has been inspired by the concept of the social constitution, as described in the following section.

Social constitution as theoretical approach to organizational context

The concept of social constitution was developed by Hildebrandt and Seltz (1989) and is an analytical understanding where social processes are evaluated through analysis of the worksite's social practice (Olsén and Clausen, 1994).

Social constitution utilizes a dialectical relation between micro-power and macro-power/structural power. The basis is an understanding of a worksite (workplace) as subject to the capitalistic mechanisms and thereby an asymmetrical balance of power between the actor groups at the worksite. The actors are to some extent structured in advance through their position at the worksite in social groups (top management, project management, supervisor level, catering staff, employees, etc.) and are thereby also linked in a macro-power structure. On the other hand, possibilities for change in relations arise from the concepts of micro-power and local policy processes. Due to the opposite interests of management in the wish for control with the worksite activities and some dependence on the self-regulation of employees, control of the employees is regarded as a special category suited for policy and changes of the control form as a political process. The current worksite policy processes are based on a number of variables: the power structure of the worksite, the interests of employees, the regulation and negotiation system (at worksite level), and the conflict and consensus history of the worksite and other parts of the organization.

Analyzed through this perspective the shaping of healthier eating at a worksite will evolve between, on the one hand, the existing traditions of the worksite, such as local views connected to the practice of the worksite, etc. and, on the other hand, the pressure generated among the

stakeholders at the worksite from the need for healthier eating and maybe health promotion in general. This pressure is mediated through both internal actors' (maybe the management support the idea) and external actors' (like external project staff/consultants) formulation and schematization of issues like health, nutrition and healthier eating.

The analyses in the case studies on healthier eating focus on the *shaping* of healthier eating as well as on the *results* of the shaping, like what is left of established opinions, routines, networks, technology etc. Figure 1 shows the combination of the social shaping perspective and the worksite policy process perspective at the time of planning the intervention (T=1) and at the time of the embedding of the intervention (T=2). The figure includes also the interaction with societal changes, like changes in governmental regulation.

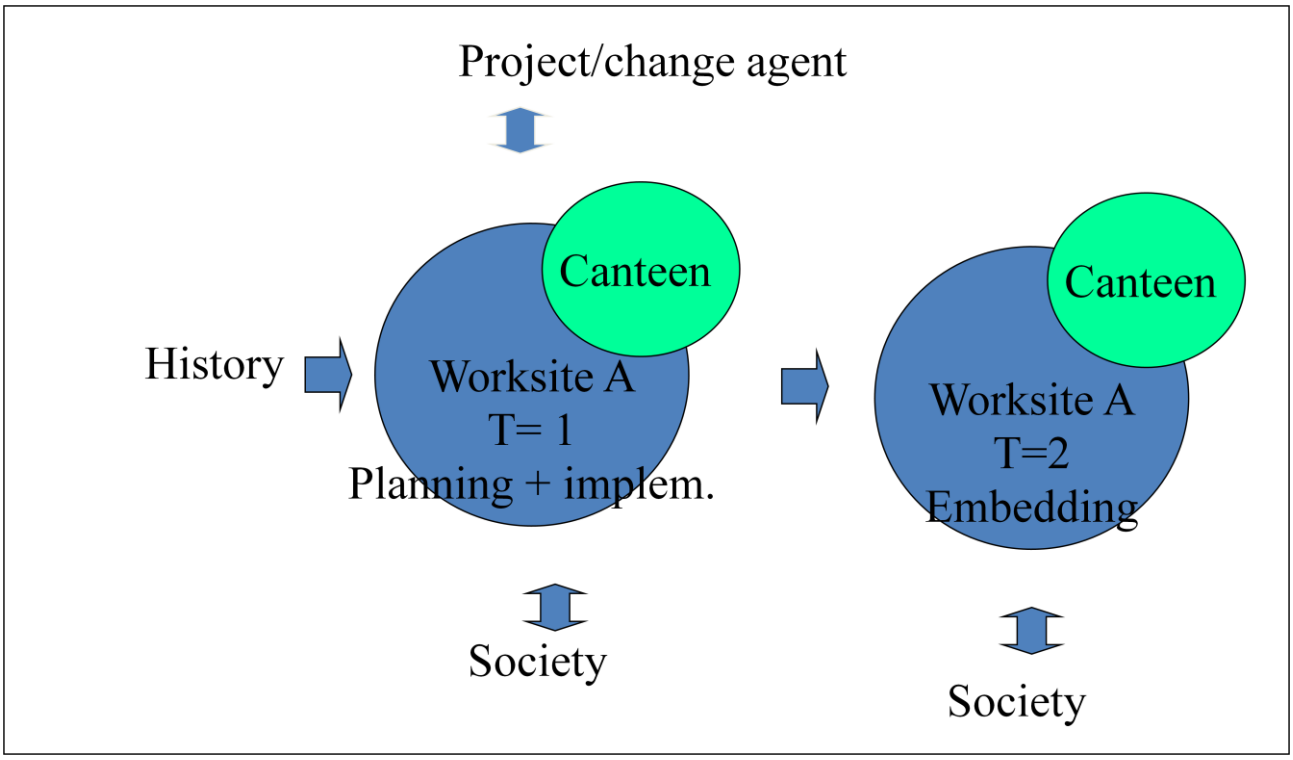

Figure 1 shows the combination of the social shaping perspective and the worksite policy process perspective at the time of planning the intervention (T=1) and at the time of the embedding of the intervention (T=2). The figure includes also the interaction with societal changes, like changes in governmental regulation.

The focus in the analysis is on how promotion of healthier worksite eating interacts with the social constitution of a workplace and how the concept and the worksite thereby are co-shaped during the process from the commitment to participate in a project, through establishment and

implementation of activities and maybe embedding of experience in new practices, new understandings etc. of different actors. Interesting themes are for example whether healthier eating gets related to other adjacent areas such as environmental and/or occupational health issues **and** whether healthier eating is obtained through offering healthier choices and/or limiting unhealthy choices.

4. Methodology

The following methods are included in the thesis: Case studies (Paper 2 and 3), a self-administered questionnaire and development of a health index defining the health criteria for canteen meals (Paper 1), records to monitor the F&V consumption (Paper 2), and qualitative research interview (Paper 3).

4.1 Case study methodology

The analysis of the sustainability of F&V intervention at the five worksites was carried out as multiple case study research with each of the five worksites as separate cases and with multiple units of analysis at each worksite with personal interviews of different stakeholders as the separate units of analysis (Yin 2003).

Case studies are suitable for explanatory research with a small number of examples, where focus is on learning and theory development, rather than theory testing. "Theory" is here meant as explanations for sustainability of F&V interventions. According to Flyvbjerg (2006) "predictive theories and universals cannot be found in the study of human affairs. Concrete, context-dependent knowledge is, therefore, more valuable than the vain search for reductive theories and universals".

According to Yin (2003) "case study is a research method which allows for an in-depth examination of events, phenomena, or other observations within a real-life context for purposes of investigation, theory development and testing, or simply as a tool for learning". The aim of the five case studies was to support analysis of questions of 'how' or 'why' (How has the embedding of F&V intervention been and why has it been like that). Multiple case study research helps to understand the influence of variability of context and to gain more general research results in terms of causes and aspects, which can explain patterns and changes within cases and differences and similarities across cases.

Case study research is suitable for research of phenomena where the researcher has little control over the events. This has been the case here. Although I was part of the intervention process, I have not been involved in the actual embedding of the interventions at the worksites.

The applied case study research methodology included the following tasks: 1) Determine and define the research questions, 2) Select the cases and determine data gathering and analysis technique, 3) Prepare to collect the data, 4) Collect data in the field, 5) Evaluate and analyze the data.

According to Yin (2003) case selection criteria are important, although the role of the single case study can only be determined after the analysis of the case has been made. The cases were selected because they were participating worksites from the F&V intervention. No selection was made among the involved worksites in the intervention since all five canteens from the intervention

were interested in taking part in the study of the long-term sustainability. This implies that the cases had participation in the F&V intervention as common historical events but at the same time the worksites are different with respect to some worksite criteria like public-private worksites, dominating gender, regional location and size. Hereby the sample of cases represents some variation within the overall topic of shaping and embedding of worksite-based F&V intervention.

Multiple sources of data were used covering both qualitative data (personal interviews) and quantitative data (registration of F&V consumption). The interview persons were selected so they represented different stakeholder groups at the worksite with respect to their formal organizational affiliation (worksite management, worksite employees, canteen management and staff).

Based on the data from each worksite a case description was made for each worksite (see under qualitative research interviews in this chapter for a description of how the interviews were conducted and the interview data analyzed).

As data analysis techniques in case studies have been applied (Yin, 2003): 1) Explanation building, 2) Time-series analysis (by combining with earlier data for F&V consumption), 3) Cross-case analysis.

Interviewing different stakeholders within the single case made them detailed in order to give a good base for cross-case comparison. The explanation building part of the case analyses were based on the earlier described theories for social shaping of concepts and for worksite policy processes. Based on the five case studies and the cross-case analyses it was furthermore considered how likely it was that findings will apply in other settings.

The '6 a day' follow-up worksite case studies (Paper 2 and 3)

The canteen managers at the five Danish worksites that participated in the '6 a day' worksite Canteen Model Study in 2001 (Lassen et al, 2004) were asked by e-mail to participate in this 5 year follow-up study in 2006. All five canteen managers accepted. The worksites were initially selected to vary with respect to employee profile (gender, age) and occupation (sedentary/physically exacting work) (Lassen et al, 2004). The five worksites were: a military base, an electronic component distributor, a bank, a town hall and a waste-handling facility.

Two of the five selected worksites were contacted by the project group because at the intervention during 2000-2002 there was a wish to study worksites with psychically active male employees (the military base and the waste-handling facility). They both accepted to participate in the intervention. The three other worksites were chosen because the canteen managers themselves made contact with the project and they all satisfied the selection criteria.

Selection criteria were that the worksites should serve more than 50 but less than 500 meals per day and have facilities to prepare meals in the canteen including handling fruit and vegetables. The worksites should represent different types of working environments (public and private sector and represent diverse company employee groups with respect to gender and sedentary or physically exacting work). Last but not least the canteen managers should be motivated to make changes towards meals containing more F&V (Lassen et al, 2004).

4.2 Questionnaire survey (Paper 1)

A questionnaire survey was constructed and conducted in order to get information from canteen managers relating to the menus available at the canteens as well as characteristics about the canteen and the worksite. The relevance of the self-administered questionnaire was assessed by a group of experts and it was pilot tested and revised to improve clarity to respondents. In Paper 1 the method is described. I did not take part in developing the questionnaire.

In order to evaluate the nutritional quality of the different meal options health criteria were constructed based on the Nordic Nutrition Recommendations (NNR, 2004) and on the Dietary Guidelines (Astrup et al, 2005). Thirteen questions from the questionnaire regarding the menus available at the canteens were selected as indicators of the nutritional quality of the menus. Two different health groups were defined, healthy and less healthy. A group of experts assessed the suitability of the health criteria in relation to its intended purpose and the content validity was examined in relation to how well it corresponded qualitatively with the recommendations.

Another objective of the questionnaire survey was to assess the characteristics of the worksites being categorized as healthy and compare them to the worksites categorized as less healthy. The characteristics of the worksites (explanatory variables) included number of employees at the worksite and at the canteen (canteen staff), number of lunches served on a daily basis, serving system (either a buffet system, where a variety of food choices are offered at a fixed price, a cash á la carte canteen where the customers select and purchase the items for lunch or a combination of the two serving systems), town vs. countryside, canteen outsourced vs. operated by the worksite, presence of a food and nutrition policy, job functions at worksite (4 categories on level of sedentary work), canteen subsidized or not (food products, equipment and/or salary, respectively), and percentage of male employees at worksite (4 categories of male/female employees).

4.3 Record to monitor the F&V consumption (Paper 2)

The 5 year follow-up data collection consisted of 3 weeks (Monday to Friday) of daily and continuously weighing all fruit and vegetables consumed at the worksite canteens, as well as measuring the exact numbers of customers each day. In order to avoid seasonal variation of F&V intake the data collection was conducted in the same months as the baseline in the intervention

study (January/February). Therefore the data collection was conducted exactly 5 years after the baseline monitoring and 4 years and 4 months after the end-point monitoring.

The data collection procedure was the same as the procedure chosen in the original '6 a day' worksite Canteen Model Study. In brief, the canteen staff was given the responsibility for measuring the consumption of F&V and the exact number of customers. The records were divided into 5 weekdays and provided the listing of all F&V that were prepared for serving. The monitoring of the F&V consumption was kept simple: Total prepared F&V per week minus the F&V not sold divided into 5 days (Monday to Friday). Four meal categories were weighed individually, since they were prepared separately; hot dishes, cold dishes, salad bar and last fresh fruit and vegetables snack. The method for measuring the F&V consumption was described, in depth, in the paper reporting the original '6 a day' Worksite Canteen Model Study (Lassen et al, 2004). Since I took part in the original intervention study I also took part in developing the F&V records.

The number of customers was counted during the 3 weeks of monitoring. Each canteen had their own way of counting customers; at the bank the number of trays was counted daily, at the town hall the cashier counted the number of customers and at the military base the counting was done by using the cash register system.

The completed records were all checked by the main author shortly after the 3 weeks of data collection and low or high records were examined for discrepancies.

4.4 The qualitative research interview (Paper 3)

The present qualitative study is based on qualitative semi-structured interviews with a sample of stakeholders at the five worksites, following a phenomenological approach (Kvale, 1996), available policies at the worksites, documents regarding the original '6 a day' intervention study and quantitative F&V measurements at the five worksite canteens (Lassen et al, 2004 and Paper 2).

At the 5-year follow-up study shortly after the F&V measurements were performed, 21 semi-structured qualitative interviews were carried out individually with different stakeholders at each of the 5 worksites (the in-house canteen manager or the external caterer, the management of the canteen, a safety representative for the worksite employees and a canteen customer). Data was collected from May to July 2006. Each interview lasted between 60 to 90 minutes and focused on several themes including motivations to join the project, motivations and barriers for sustaining the F&V consumption since the intervention, interaction with other worksite related matters, and the strategies for increasing the consumption of F&V. The interviews were tape recorded and transcribed by an experienced student and checked by the interviewer. All transcriptions were coded by the interviewer inspired by the combination of the social shaping perspective on concepts and the worksite policy process perspective (Kamp et al, 2005. Also the method meaning

condensation with respect to selected points was undertaken (Kvale,1996). Comparative analysis was designed to reveal common traits, variation and differences between the five worksites.

5. Results

5.1 Paper 1

Workforce gender, company size and corporate financial support are predictors of availability of healthy meals in Danish worksite canteens

The main findings of this study showed that only 12% of the worksite canteens applied to the healthy group combining all 3 meal categories (hot meal, sandwich and salad). 553 canteen managers participated in this questionnaire survey resulting in a response rate of 29 %. An average worksite canteen had 4.2 canteen staff and served daily meals for 160 customers.

The size of the worksite played a role; the bigger in terms of number of meals served on a daily basis the higher the odds of serving healthier menu options. Furthermore, corporate financial support of the canteen played a role - canteens being subsidized had significantly higher odds of serving healthy menu options. Having a nutrition policy seemed to influence the odds of belonging to the healthy category, but only with regards to sandwiches. 23 % of the canteens had a nutrition policy. Finally, the employee profile seemed to influence the availability of combined healthy options at the canteen with respect to the gender distribution. Worksites with less than 25% male employees had 14 times higher odds of being overall healthy compared to worksites with more than 75% male employees.

This survey study was compared to another survey study of Danish worksite canteens from 1995 (Bech & Mikelsen, 1996). These results were analyzed as part of this survey but are not all presented in Paper 1. Over the 10-year period a significant change in the food service systems was seen toward the buffet system in the canteens. The food service system is either a buffet system, where a variety of food choices are offered at a fixed price or cash system with a separate price for each item on the menu. Significantly more has buffet system (70%) in 2003 compared to 47% in 1994 ($p< 0.001$). Significantly less has cash system (49%) in 2003 compared to 83% in 1994 ($p< 0.001$).

The majority of the worksites are subsidizing the canteens (staff, inventory, food products or a combination). In the 2003 survey only 11 % of the canteens were not subsidized. Especially salaries and inventories are being subsidized. In 2003 the corporate financial support covered areas as salary (62% yes and yes, partly), inventory (67% yes and yes, partly) and products (23% yes and yes, partly). There was no information on the size of the financial support. From the survey around 25 % of the participating canteens are outsourced to catering businesses.

5.2 Paper 2

Long term sustainability of a worksite canteen intervention of serving more fruit and vegetables

The main findings were that four out of five worksite canteens were able to either sustain the achievements from the F&V intervention or even increase the F&V consumption from baseline to the 5 year follow-up with an average of 95 g per customer/meal/day. One canteen did not sustain the intervention and almost went back to the baseline. On average the five canteens at the 5 year follow-up had an average F&V consumption of 208 g per customer/meal/day. See figure 2 for average F&V intake by worksite over time.

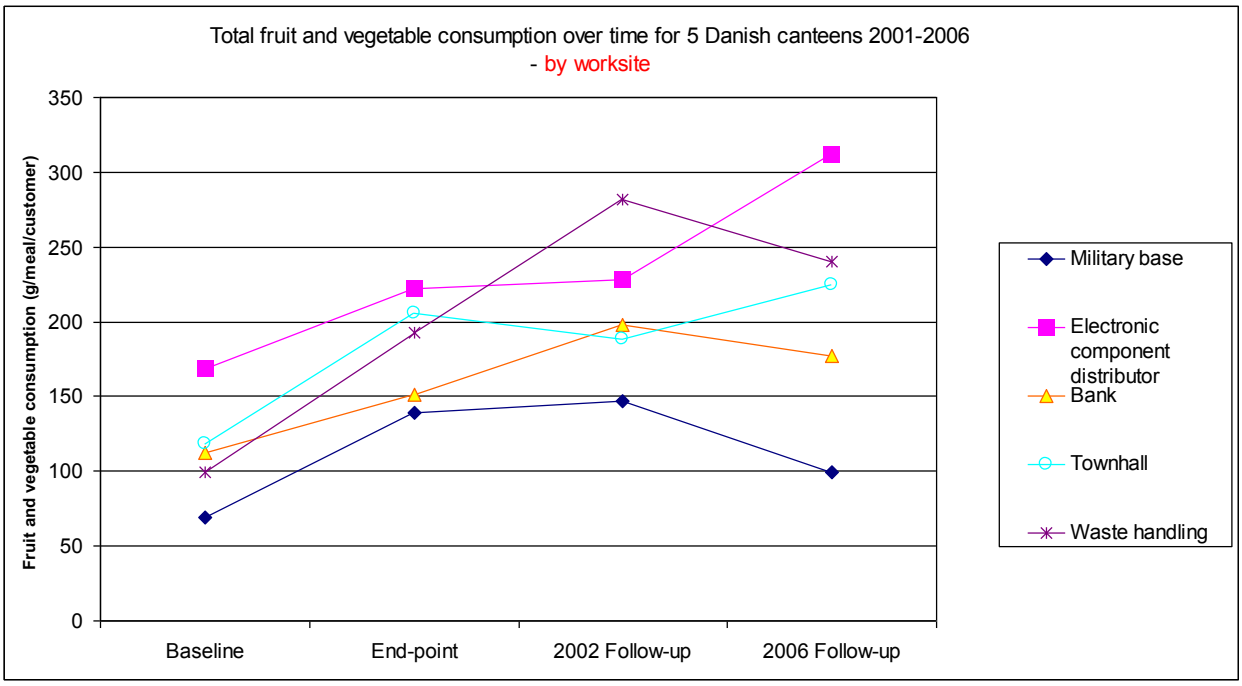

Figure 2. Average F&V consumption at the five different worksites measured before the intervention (baseline) in January-February 2001, after the intervention (end-point) in September-October 2001, at the short-time follow-up in January-February 2002 and at long term follow-up January-February of 2006.

Figure 2 shows the average F&V consumption per customer over time for each of the five worksites (not presented in Paper 2). The figure also shows the differences in F&V consumption at the baseline, the end-point and the short-term follow-up compared to the long-term follow-up. Overall, a net average increase of 95 g F&V per customer per day was achieved from baseline to long-term follow-up measurements for the five worksites. One of the worksites (the military base) failed to

sustain the increase in F&V consumption from the baseline to end-point in the long term. At the military base an insignificant increase of 18 g per customer per day compared to the baseline was seen ($p=0.28$) at the long term follow-up measurements. The other four worksites all increased the F&V consumption significantly from baseline to the long-term follow-up measurements ($p<0.001$). One of these four worksites further increased significantly ($p<0.001$) its F&V consumption from both the end-point and the short-term follow-up to the long-term follow-up measurements (the electronic component distributor increasing from 222 to 228 to finally 312 g/meal/customer). As no significant differences in F&V consumption was seen from the end-point to the long-term follow-up measurements in the bank, the town hall and the waste-handling facility these worksites sustained the increased F&V consumption.

5.3 Paper 3

Strategies to promote healthier eating at worksites - analysis of experiences from a social shaping perspective

The main finding was that a worksite intervention needs to be tailored to the needs of the particular worksite environment in which it is implemented. Furthermore this tailoring needs to be done in close partnership with the local stakeholders. The analyses show a number of themes are important to sustainability of F&V worksite interventions. Outsourcing the food service may challenge the sustainability but may also be a way of ensuring the necessary competences for a more F&V intensive food supply. Structural changes of the worksite, like re-structuring, may also challenge the sustainability if this implies frequent changes of worksite employees and new employees question the F&V intensive food supply. The engagement of the canteen manager and the ability to develop strategies for integration of more F&V in the food supply and good cooperation with the F&V suppliers play also a crucial role.

Three of the worksites had either been outsourced or were in the process of being outsourced. The different local context influenced the outsourcing and thereby the impact on the F&V consumption at the canteens in three different ways: a decrease, a stand by or an increase.

The measurements of F&V consumption at the five worksites (Paper 2) showed that four of the five worksites sustained the F&V intervention. The military base did not sustain the F&V intervention and almost went back to the baseline F&V intake. The military base differed from the other worksites in several ways: the canteen had two secluded groups of customers, the canteen was not financial supported by the worksite and furthermore the canteen had a request for proposal to contract out the business. Also the meal service system, a cash system, was different from the four other canteens having a buffet system and furthermore the canteen manager didn't participate in the meal preparation.

See Paper 3 for the other findings of the study.

6. Discussion

The discussion consists of two main parts, first a reflection on the quantitative and qualitative methods being used in this thesis, and secondly a discussion of the findings in the three papers. The findings are discussed in details paper by paper in relation to relevant research in the field.

6.1 Reflection on the quantitative and qualitative methods

6.1.1 The self-administered questionnaire (Paper 1)

The questionnaire was part of a survey already performed in 2003 before the Ph. D. study started. The self-administered questionnaire was constructed in order to describe the healthiness, quality and convenience of meals served in the Øresund Region (Denmark and Sweden). The questionnaire was used as the data source in the analysis made in Paper 1. The canteens were divided into two healthiness groups, the healthy and the less healthy based on the nutritional value of the menus. In order to evaluate the nutritional quality of the different meal options in this survey health criteria were defined based on the Nordic Nutrition Recommendations (NNR, 2004) and on the Dietary Guidelines (Astrup et al, 2005). Lassen and colleagues have developed and validated a new simple healthy meal index that seemed successful in ranking canteen meals according to their nutritional quality (Lassen et al, 2010). Furthermore it might be a valuable tool to both researchers and to nutritionals professionals, e.g. caterers in order to evaluate the healthiness of the meal options in the canteen.

The canteen managers were asked to specify the menus available at the canteen, and on the basis of the answers the canteen was placed in either the healthy or the less healthy group. The questionnaire was not validated for sensitivity to discriminate between healthy and not-healthy meals because it was originally not intended for that analysis. By using a self-administered questionnaire there is always a risk of response bias. In order to minimize response bias the questionnaire was pilot tested and reviewed to improve clarity to respondents.

In this survey there is no data available on the actual nutritional quality of the meals served, nor any data on whether the worksites belong to either the private or public sector. Furthermore no data are available on the price strategies or on how many menus actually being sold.

One of the drawbacks using a self-administered questionnaire is that the response rate may be rather low, especially if there is no follow-up by phone or email. The response rate was low only 29%. When studying organizations the response rate is normally a challenge (Moscowitz et al, 2001, Mikkelsen, 2004). The National Board of Health did a survey of the health promotion activities in Danish worksites in 2007. The survey was conducted as a partly telephone and internet-based survey. The worksites' management was mailed and contacted whereas in our

survey it was a self-administered mailed questionnaire mailed to the canteen manager. The response rate in the 2007 survey was 55 %, almost the double as the questionnaire survey (29 %) (National Board of Health, 2008). We have no knowledge why the response rate was so low; neither do we have any information regarding the canteen managers who did not answer the questionnaire. It is likely that relatively more of the health conscientious canteen managers would answer compared to the less health conscientious. If that is the case here, then the canteen meals are even less healthy than shown by the questionnaire survey.

6.1.2 The record to monitor the F&V consumption (Paper 2)

The data-collection procedure to monitor the F&V consumption in the sustainability study was chosen, because it was identical to the procedure performed at the '6 a day' worksite Canteen Model Study. It was developed to be as simple as possible to handle for the canteen staff during their daily routines. Besides providing data to the research project, the weighing was also a very important part of the original intervention strategy to provide ownership to everyone in the canteen and to help keeping track of their objectives. Still, to monitor all the daily F&V was annoying to the staff since they monitored the F&V consumption on a daily basis for a 3 week period. This data collection procedure is therefore only suitable in the case of (highly) motivated canteens.

There is no data on the plate waste, only data on waste related to the meal production in the kitchen. Our impression is, however, that the (customers) plate waste in general is low. This is supported by Gray et al. (2007) that suggested that fruits and vegetables taken can serve as a proxy measure for amounts eaten in a school lunch. Neither is intake data available on the individual user level available. The results might conceal large variations between customers since the data are based on total F&V consumption relative to the number of customers. One of the canteens (the waste handling) had an external caterer that never used the method before, so the monitoring might be biased, even though the external caterer was taught how to monitor and the data was carefully revised.

Since the F&V intervention was not sustained at all worksites and there were certain limitations to interpret the F&V measurements at the worksites, the sustainability of the intervention might be questioned. The F&V intervention was not a controlled intervention so the sustainability could also be due to other factors like a change in the meal service system (the bank, the waste handling and the town hall), change in the employee profile causing a change in the meal choice (the town hall) or a change in the society towards healthier eating. A multivariate analysis with these variables (employee profile, food service system) and other characteristic could either support or refute the claim that the changes in F&V consumption are due to the intervention. Since we do not have these data the conclusions of the study need to be moderated. In Paper 3 the F&V intervention and the embedding of the intervention is analyzed and evaluated from a social shaping perspective and a policy process perspective. The analysis is part of a careful process evaluation made at each site in

order to understand why some healthy eating interventions are sustained better at some worksites than at others.

The advantage of this chosen measurement method is that data are comparable to the data from the '6 a day' worksite canteen study, not only because the same records are being used but also because the data was obtained at the exact same 3 week period as in the original study in order to avoid seasonal changes in F&V intake. Another advantage is that this method takes into account that the day-to day variability might be high. Multiple days of recording are required to capture usual consumption of F&V.

6.1.3 The case study design and qualitative research interview (Paper 3)

Qualitative methods are useful in order to understand themes of the everyday life from the subjects' own perspective (Kvale, 1996). The qualitative methods are useful for studies of social and human experiences. They include various strategies for systematic collection, organization, and interpretation of textual material obtained by talking with people or through observation.

The aim of the qualitative research is to investigate the meaning of social phenomena as experienced by the people themselves (Burkett in Malterud, 2001; Kvale, 1996). The researcher is critical for the quality of the research project. In qualitative research it is important to ascertain the reliability, that refers to how consistent the results are, validity referring to whether an interview study investigates what it intends to investigate and generalisability meaning if the results might be translated into other studies or settings and foretells what might happen (Kvale, 1996).

By interviewing, the interviewer herself is the main instrument for obtaining knowledge and the interview is part of the analysis as a social interaction between the interviewer and the interviewee (Kvale,1996). When interviewing it is important to avoid systematic bias and to assure a strong and valid research process. Furthermore the project concept might influence the perception of healthier eating at the worksite of different actors at the worksite. This interaction, including the reflection of the actors about their own role, is important to be aware of and understand as part of the analysis of the shaping of healthier eating (Forman & Jørgensen, 1999; Schön 1983).

Conducting interviews: When interviewing I started the interview by introducing the purpose and the context of the interview and it was rounded off by a debriefing – before ending the interview by asking if the subject had anything more to say, and after the interviews asking the subject his/her experiences of the interview. I used an interview guide (Appendix 1) with an outline of the topics I wanted to cover. I used the interview guide as guidance but did not follow the questions strictly. I tried to cover the themes and on the same time kept the flow of the conversation and motivated the subjects to talk about their experiences and feelings. All interviews were conducted in a good atmosphere.

Transcription of the interviews: The transcriptions of the interviews are stated in the methodology section (4.4). All transcriptions were done by an experienced student, word by word after I had decided on style of the transcription. Afterwards I checked the reliability and validity of all the transcriptions while I listened to the taped interviews.

Analysis of interviews: All 21 interviews were analyzed and interpreted by me and discussed with the co-author of Paper 3 on the basis of the transcribed interviews. I used the meaning condensation entailing the interview. Meaning condensation involves a reduction of large interview texts into briefer formulations (Kvale, 1996). Comparative analysis was designed to reveal common traits, variation and differences between the five worksites. Making the interviews with different stakeholders as detailed as possible worked well as a better base for the case descriptions and the cross case comparison.

Refection on own role: When I went back to the canteens and conducted the interviews it demanded a balance between keeping distance and having proximity. I was aware of this double role and my main supervisor, who is the co-author on Paper 3, kept a critical view upon the data in order to reduce bias. Also when analyzing the data I could have an interest in having the intervention to be sustained and be successful, also here the co-author kept a critical eye on the analysis. I have tried to be open, clear, sensitive, steering, critical interpreting when interviewing, analyzing, and interpreting the data (Kvale, 1996; Yin, 2003).

Reflection on the process: The research questions that were decided on was partly due to the F&V intervention and partly because I knew the worksites and the intervention so well. The research questions as the interview guide was developed and discussed with experienced researchers from other areas as for example the school setting.

Generalizability: The qualitative methods are useful in order to understand the meaning of central themes in the subjects' world and his or hers relation to it. The qualitative study in this thesis is theoretical based and discussed in relation to theory. The design and the theoretical understanding of the study might me generalized and used in order to understand specific conditions and meanings that would implicate other studies or setting.

6.1.4 Combining the quantitative and the qualitative method

The methods applied in this thesis are quantitative (Paper 1 and Paper 2) as well as qualitative (Paper 3). The two types of methods are often thought as conflicting but are complimentary, and are often applied in sequential order (Malterud, 2001).

The idea of combining the quantitative and qualitative methods is not new. Steckler (1992) described different ways of integrating the two methods, for example qualitative methods may be used to develop quantitative measures, for example focus groups used to develop questionnaire

items. However qualitative methods may also be used to help explaining quantitative findings, for example semi-structured interviews or in-depth interviews to get a better understanding of the meanings and implications of the findings. Also quantitative and qualitative methods may be used together for cross-validation and triangulation. The aim of the triangulation is to increase the understanding of complex phenomena because multiple and diverse observations can enrich the description of phenomena (Malterud, 2001).

Multiple sources of data were used in this thesis covering the personal interview with different stakeholder (qualitative data) and the registration of F&V consumption (quantitative data). The objective of doing the qualitative interviews was to get a deeper understanding of why the five worksite canteens performed different in sustaining the F&V intervention. The interviews gave the stakeholders personal experiences on the F&V intervention and the sustainability of it and that enlightened the reasons why it was easier for some of the worksites to sustain the intervention. The interviews gave a more deeply understanding of the differences between the canteens in their ability to sustain the F&V intervention by analyzing the data from a social shaping and a worksite policy process perspective. Furthermore the quantitative data gave another perspective on the qualitative interviews a sort of the whole picture of a health promotion intervention.

6.2 Discussion of the findings

In this part of the chapter the findings of the three papers are discussed in details, paper by paper. Also the papers are discussed in relation to other research and analysis in the field.

6.2.1 Paper 1 – Healthiness of canteens

Paper 1 is based on a survey that investigates the availability of healthy Danish canteen meals by analyzing a questionnaire mailed to canteen managers. A canteen healthiness index is proposed in order to group the canteens into different groups based on the availability of healthy meals. The survey showed that there is a strong need for strategies that promote healthy eating at worksite canteens. The analysis of the questionnaire survey presented in Paper 1 showed that the meals served in Danish worksite canteens are not healthy nor are the healthy meals easily available. Only 12% of the canteens applied to the healthy group combining all 3 meal categories (hot meals, sandwiches and salads). In particular worksites with more than 75 % female employees served healthy meal options on a regularly basis. The size of the worksite was positively correlated with more healthy meal options and furthermore a positive relationship between corporate financial support and the availability of healthy meals.

Paper 1 and other studies of worksite meals in Denmark and in Belgium have showed that the meals served in the canteens often are too high in fat and too low in F&V and don't comply with the recommended food guidelines (Buttriss et al, 2004; Lassen et al, 2004; Lassen et al, 2007, Lachat

et al, 2009a). On the other hand the survey of Danish worksites showed that from 1997 to 2005 the canteens were having healthier food available (free water, fruits, fat-reduced meals, salads and whole meal bread). In Finland, Ross et al (2004) demonstrated that having lunch at a staff canteen was associated with recommended food habits. In Finland authorities have required that all meals provided by public food service outlets are served with vegetables or salad (Ross et al, 2004).

Having a policy regarding smoking or drinking alcohol are more common at Danish worksites than having a nutrition policy (National Board of Health, 2008). The 2007 survey revealed that 98 % of the worksites had policy/rules concerning smoking, 96 % had an alcohol policy, 61 % had a nutrition policy and 44 % had a policy concerning the working environment and stress. The survey also revealed that having a policy did not imply that that worksite actually did have activities relating to the policy – and the other way around (National Board of Health, 2008). In Paper 1 only 23% of the canteens had a nutrition policy (compared to the 61 % in the other survey) and having that seemed to affect the availability of healthy meal options but only in regard to sandwiches. The participants in Paper 1 did include smaller worksites whereas the other survey only included worksites with more than 10 employees, so it might be hard to compare the two surveys.

The National Board of Health survey revealed large inequalities with respect to health promotion at the worksites in relation to branch and geographic region, only 7% of the construction sector had a food scheme in comparison to 53% from the finance sector (National Board of Health, 2008). In relation to diet and other aspects of lifestyle research showed inequalities; people with higher education eat healthier and live healthier (smoke less, consume less alcohol and have a higher level of physical activity) (Groth el al, 2009a, Groth et al 2009b). Health problems and changes in body weight (e.g. obese became more obese) were seen among employees due to long-term stress where the employees lacked influence and control over their own work (Siggard et al, 1996; Hannerz et al, 2004; Overgaard et al, 2004; Overgaard et al, 2006). Also in relation to work and occupational health and safety social inequalities were shown related to the worksite (Burr et al, 2003; Bøggild et al 2001). Health promotion initiatives at the worksite should focus not only at the canteen meals, but also include occupational health and safety issues in order to reduce health problems and social inequality.

The worksite needs to be aware of the importance of serving meals at the worksite canteen that comply with minimum nutritional recommendations. Worksites supply meals for a regular clientele and the meals may be the main meal of the day. Achieving a healthy workforce would benefit not only the individual but also bring benefits to employers and society. Since individuals spend up to 60% of their waking times at work worksite interventions have significant potential to improve dietary habits (Mhurchu et al, 2010). In addition food served at worksite canteens may serve as a model of an optimal meal also influencing people's food choice on other occasions (Wanjek, 2005, Mhurchu et al, 2010).

Paper 1 showed that the chances of having a healthy meal were significantly higher for an employee at a worksite with a majority of female workers or for an employee at a bigger worksite. Other studies have showed that men consume less F&V than women and are less health conscious (Sorensen et al, 2004; Groth et al 2003; Groth et al, 2009b; Lassen et al, 2007). The survey reported in Paper 1 also showed that the size of the worksite influenced the healthiness of the meals, which is in line with McMahan et al (2001) that found that smaller companies have limited access to health promotion programs.

In order to prevent obesity and nutrition-related diseases public health policies by means of legislation or economic instruments have to improve access to healthier food – especially for groups with lower educational level (Swinburn & Egger, 1999; Groth et al 2001, Elinder & Jansson, 2009). Worksite canteens are obvious settings for environmental strategies that increase the availability of healthy food and reduce barriers towards healthy eating. (Whitelaw et al, 2001, Sorensen et al, 2004; Drewnowski & Darmon, 2005; James, 2007; Elinder & Jansson, 2009; Lachat et al, 2009a). In particular worksite canteens which often are subsidized provide an ideal environment to test the potential of economic incentives to change food purchasing behavior (Mhurchu et al, 2010).

6.2.2 Paper 2 - Sustainability

In Paper 2 the sustainability of an F&V intervention was measured in a 5 year follow-up study at the five worksite canteens. This study showed that it is possible to sustain F&V interventions at the worksite. Also, the results from this study imply that a realistic goal setting for the consumption of fruits and vegetables in worksite canteens are 150 to 200 g per meal per customer. The five canteens on average increased the F&V consumption from baseline to the 5 year follow-up with 95 g/meal/customer to an average consumption at the level of 208 g/meal/customer. However not all worksites were equally successful, indicating that more factors influence the sustainability of an intervention. Four of the five canteens sustained the F&V intervention, but one, the military base failed to sustain the intervention. The average F&V consumption exposed great differences between the five canteens (87, 312, 178, 223 and 240 g meal/customer respectively).

A number of other intervention studies at worksite settings have demonstrated that it is possible to increase F&V intake among employees (Buttriss et al, 2004; Glanz & Mullis, 1988; Ross et al, 2004; Sorensen et al, 2004). The same conclusion is found in systematic reviews analyzing the evidence on effectiveness and programs promoting F&V intake among adults (Pomerleau et al, 2005; Engbers et al, 2006; Story et al, 2008), but little is known about the long-term persistence of these changes and especially after the actual intervention period has ceased and the changes are supposed to be sustained.

The studies showed that especially strategies towards the hot meals were the easiest to sustain and added the most F&V per meal [50, 99, 72, 76 and 115 g/meal/customer] and strategies towards

increasing F&V in cold dishes seemed harder to sustain. The cold dishes did not include much F&V to the total F&V intake/meal (11 to 32 g/meal/customer). Only the electronic component increased the amount to 68 g/meal/customer. The salad bar also seemed somewhat easier to sustain at four of the canteens (60 to100 g/meal/customer). Also placing salads at different places at the buffet to reach non-salad eaters seemed to be a good strategy. Finally the F&V snack only added from 11 to 23 g/meal/customer except for the electronic component distributor that added 55 g/meal/customer.

One of the five worksites (the military base) was not able to sustain the F&V intervention at the 5 year follow-up even though the 1 year follow-up F&V consumption was sustained. The military base is in the process of being outsourced and the worksite canteen is not financially supported. There seems to be a relationship between the financial support of the company and the availability of healthy meals (Thorsen et al, 2009). An initial implementation success does not necessarily predict a sustained effect of the intervention. Stange et al supports that finding (Stange et al 2003). One of the worksite canteens (the electronic component) further increased the F&V consumption significantly and the other three worksites sustained the F&V consumption.

Organizations may vary in the extent to which the pre-existing structures and processes are able to facilitate organizational change to promote health (Swerissen, 2004, Dooris, 2005). Therefore it is crucial to identify and address barriers to and enhance facilitators of organizational and environmental changes within worksites (Sorensen et al, 2004). The five worksites in the study were different with respect to gender, age, physically exacting/sedentary work. Two worksites were private, two were public worksites and one was semi-public. Four worksites had a buffet meal service system and one had a cash system (the military base). Two worksites had in-house caterer, two had external caterer and one had an in-house caterer but a request for proposals to contract out the business (the military base). The F&V consumption at the canteens at the baseline varied from low at the military base (69 g/meal/customer) to high at the electronic component distributor (168 g/meal/customer) with an average of 113 g/meal/customer. Nevertheless all five worksite canteens succeeded in fulfilling their goals by deciding their own strategies at each canteen reaching at end-point an average of 181 g/meal/customer, and even higher at the 1 year follow-up (208 g/meal/customer). At the 5-year follow-up study four of the five worksites sustained the F&V intervention and one failed.

In an international review of interventions aiming at increasing the F&V consumption through interventions at worksites shows that that the impact is depending on: Management support, information and training, supporting organisational structures, employee participation in planning and implementation, focus on more factors than the diet e.g. worksite health and safety, and involvement of employees' social context, like worksite colleagues and family (Sorensen et al, 2004; Sheirer, 2005). The finding was supported by O'Loughlin and collegues (1998) when investigating sustainability of health promotion interventions in qualitative case-studies. Also Lassen

et al (2004) suggested similar factors might have influenced the short-term sustainability of the '6 a day' Worksite Canteen Model Study. Others have suggested that substantial participation in program development and implementation by key stakeholders will lead to higher perceived program ownership and increased sustainability. (Gruen et al, 2008, Sorensen et al, 2004).

The conduct of worksite-based research studies is very challenging and greater use of frameworks for interventions that acknowledge the complexity of the environment and the need to intervene at many levels may help to achieve more meaningful changes (Swinburn et al, 1999; Mhurchu et al, 2010). Quantitative and qualitative research methods have to be integrated in order to better evaluate the reasons for success or failure of such complex interventions (Dooris 2005; Mhurchu et al, 2010).

The setting approach to promote public health has still 20 years after the Ottawa Charter was adopted a poorly developed evidence base of effectiveness (Dooris 2005; Mhurchu et al, 2010). Another problem within the setting-based health promotion research is the diversity of conceptual understanding and real-life practice that presents obvious difficulties in generating research that allows comparability and transferability (Whitelaw et al, 2001, Green et al, 2001). Thirdly it is very complex to evaluate ecological whole system approaches (Dooris, 2005). Theory-based evaluation has been advocated within the fields of health promotion and community change, one approach being theories of change which draw on both logic models and realistic evaluation (Dooris, 2005; Green et al, 2001).

6.2.3 Paper 3 – Social shaping

In this thesis a theory-based evaluation is presented, namely the combination of a social shaping perspective and a worksite policy process perspective (Bijker 1995; Olsen & Clausen 1994; Kamp et al 2005). In order to get a deeper understanding of the sustainability of healthy food interventions at worksite canteens this thesis analyzes the F&V intervention and the sustainability of the intervention based on a combination of a social shaping perspective and a worksite policy process perspective (Bijker 1995; Olsen & Clausen 1994; Kamp et al 2005).

The analyses presented in Paper 3 showed a number of themes are important to sustainability of F&V worksite interventions. We looked at what were the success factors for sustaining the F&V intervention, and why the intervention was possible sustained better at some worksites than at others. The following themes were analyzed across the cases: 1) the F&V strategies, 2) the meal serving systems, 3) the canteen staff and canteen manager and their perception of healthy eating and their motivation and self-efficacy, 4) the management and their perception of healthy eating, 5) the worksite (changes during the F&V intervention and afterward, history, working conditions, different policies etc), 6) The roles of the project team, internal as well as external change agents.

F&V strategies and the consumption of fruit and vegetables: The F&V consumption at the 5-year follow-up showed that 4 canteens still sustained the F&V intervention and that one canteen (the military base) failed to sustain the intervention and almost went back to baseline. The staff and canteen managers at the five worksites developed their own F&V strategies inspired by the '6 a day' -project coordinators and the intervention was thereby modified to fit into the specific worksite and the social context of the worksite.

Meal serving system: Among the five worksites only the military base had a cash system, where the other four had a buffet system. At the military base the F&V intake went almost back to the baseline, whereas the electronic computer increased the F&V intake. The other three worksites all sustained the intervention.

A Danish questionnaire survey with 553 respondents showed that 70% of the canteens had a buffet serving system and 49% had a cash system (only, or in combination with a buffet system) (Thorsen et al, not published). A buffet meal service system might be better in order to sustain the healthy eating intervention. Lassen et al (2007) showed in a comparison study of meals from 15 canteens that eating at canteens serving buffet style was associated with an increase in F&V and a lower energy density of food for both gender. Another advantage of the buffet system is that the customers are more tempted to try something new, several canteen managers commented (Thorsen, 2003;2).

Both at the waste handling facility and at the electronic component worksites some of the customers complained about eating too much and gaining weight. Some customers had a problem getting adjusted to the buffet system and therefore ate too much and gained weight. Another problem could be customers' perception of portion size; people have to adjust their eating to their physical activity level and their nutritional needs.

The canteen staff and canteen manager: Four of the five canteen managers were selected to participate in the intervention in 2001 because they were motivated for making an F&V intervention. The canteen manager at the waste handling facility was asked to join the project because the worksite joined another health promotion intervention. At the 5-year sustainability study the canteen managers were still motivated. However, the conditions for running a canteen had changed at three of the worksites: one (the bank) was outsourced and another (the waste handling) got an external caterer and the military base had a request to contract out the business.

In order to create staff involvement at the F&V intervention the staff and canteen managers were asked to decide locally at the canteen on the goals and the F&V strategies. Everyone in the canteen participated in kick-off seminar, team-building and educational sessions, goal setting and deciding on F&V strategies (Lassen et al, 2004). Neither at the military base nor at the bank the initial motivation to join the project among the staff was as high as at the other 3 canteens. But during

the intervention the approach of most staff changed and they took ownership for the intervention. The staff at the other three worksites was more supportive from the beginning.

The cooks and the staff at the military base did occasionally rotate between the military bases. The chefs at the 5-year follow-up did not have focus on F&V in the meals. Since the canteen manager did not participate in the meal preparation he didn't notice and seemed surprised when he experienced the decrease in F&V. The canteen manager was still motivated for F&V promotion intervention at the worksite, but while he worked at a policy paper for ensuring healthy meals at the worksite he forgot to ensure sustainability of the F&V intervention at his own canteen.

The canteen manager at the electronic component was very motivated and succeeded in increasing the F&V consumption without management support. As time went on she convinced not only the management but most of the employees at the worksite by being very creative in inventing new events at the canteen, e.g. soup day (Friday), grandmother's day (old-fashioned style meals), take-away day (Wednesday). The canteen manager also succeeded in persuading the management to get a worksite nutrition policy to support her healthy meals in the canteen, but as the F&V measurements showed (Paper 2) she did not really need the nutrition policy to serve healthy meals. Already at the baseline F&V measurements the canteen had the highest F&V consumption being 169 g/meal/customer. A motivated canteen manager with the ability to develop strategies for integration of more F&V in the food supply and good cooperation with the F&V suppliers is important for the success of an intervention. Not only the canteen manager but also the conditions at the worksite like policies and management support are important for the success of an intervention.

The worksite management and their perception of healthy eating: Management support to the canteen differentiated from acceptance and silent support (the military base and the electronic component) to support (the bank and the town hall) to being the driver of the change process (the waste handling). At the bank and at the town hall the F&V intervention fitted perfectly well to the policies at the worksite and therefore the managements were supportive the whole time but also the canteen managers were motivated for conducting the F&V change process. At the waste handling the management was the driver of the health promotion program including healthy meals at the canteen. At the military base the management support was lacking and the F&V intervention was not sustained. At the electronic component the canteen manager only had a silent management support but never the less increased the F&V intervention and was the driver of the health promotion intervention.

The majority of the worksites are **subsidizing** the canteens (staff, inventory, food products or a combination). Only 11 % of the participating canteens in the 2003 questionnaire survey were not subsidized. Especially salaries and inventories are being subsidized. (Thorsen et al, not published). The questionnaire survey (Paper 1) showed a positive relationship between corporate financial

support and the availability of healthy meals (Thorsen et al, 2009). The financial support to the five worksite canteens differentiated, the military base was run for a profit basis, while the others were financial supported.

Structural changes of the worksite, like re-structuring, may also challenge the sustainability if this implies frequent changes of worksite employees and new employees question the F&V intensive food supply. The engagement of the canteen manager and the ability to develop strategies for integration of more F&V in the food supply and good cooperation with the F&V suppliers play also a crucial role.

Worksite policies: Having a policy regarding smoking or drinking alcohol are more common at Danish worksites than having a **nutrition policy** (National Board of Health, 2008). In a questionnaire survey of Danish worksite canteens only 23% of the canteens had a nutrition policy and having that seemed to affect the availability of healthy meal options but only in regard to sandwiches (Thorsen et al, 2009). In this study all five worksites had policies concerning smoking and alcohol, and only two of the worksites had a nutrition policy (the town hall and the electronic); three had kind of nutritional recommended guidelines (the military base, the bank and the waste handling facility). The town hall furthermore had a health policy and a policy about being environmentally sustainable by using organic products which had synergetic effects on the consumption of F&V because organic meat is expensive compared to conventional meat. At the waste handling, at the bank and at the town hall the F&V intervention fitted perfectly well to the policies at the worksite. Furthermore the town hall after the intervention got a public health policy also supporting the healthy meals at the canteen. In conclusion it seemed that having a nutrition policy or other public health policies at a worksite supported the health promotion interventions (the town hall, the bank, the waste handling). However, a very motivated canteen manager with a silent support from the management may succeed in serving healthy meals without a nutrition policy (the electronic component distributor).

Contracting out (outsourcing) the food supply may challenge the sustainability but may also be a way of ensuring the necessary competences for a more F&V intensive food supply. In a questionnaire survey 25 % of the canteens were outsourced to catering businesses and ran by an externalal caterer, while 75% were run by the worksite and therefore in-house. (Thorsen et al, not published). Three of the 5 worksite intervention canteens were either outsourced, having an external caterer or having a request for proposal to contract out the business. Outsourcing of a canteen might challenge the sustainability of a healthy eating intervention (the military base and the bank) but it also might also help sustaining an F&V intervention (the waste-handling facility). At the waste handling the canteen was outsourced to an external caterer, keeping the canteen staff as employee at the worksite to serve the buffet with the catered food. At the bank the canteen was outsourced to an external caterer that kept most of the staff and the canteen manager. At the bank the healthy aspects of the worksite eating was made part of the criteria of the outsourcing. The

military base had a request for proposal to contract out the business and that including some uncertainty regarding the organization during the last years took away the focus from F&V in the meals.

The project team, internal and external change agents: It is crucial to identify and address barriers to and enhance facilitation of organizational and environmental changes within worksites (Sorensen et al, 2004). The canteen managers acted as internal change agents, where some were supported by the management (the bank and the waste handling). The all had their own way of dealing with the project and the F&V intervention, the staff, the customers and the management.

The external change agents focused on supporting the canteen managers when working at the F&V intervention at the local worksites. The support consisted of setting up different network groups, doing team building courses for the staff, the change agents and the canteen managers themselves, having a newsletter set up with experiences from all five worksites, and helping with contact to the media.

The external change agents took from the start of the project contact to three very skilled canteen managers that acted as role models and ambassadors towards the canteen managers and as advisory boards towards the external change agents and the project. Throughout the project they were used to talk to the participating canteens about their own experiences from their canteens and how they coped with focus on F&V in the meals the whole time, the contact with the customers, problems with the staff, the managements etc.

In conclusion from Paper 3: The analyses show a number of themes are important to sustainability of F&V worksite interventions. Outsourcing of the food supply may challenge the sustainability but may also be a way of ensuring the necessary competences for a more F&V intensive food supply. Structural changes of the worksite, like re-structuring, may also challenge the sustainability if this implies frequent changes of worksite employees and new employees question the F&V intensive food supply. The engagement of the canteen manager and the ability to develop strategies for integration of more F&V in the food supply and good cooperation with the F&V suppliers play a crucial role. However, economic restructuring of a worksite may challenge the sustainability of an increase in the F&V intake. The study did not identify negative interaction with health safety activities at the worksites, which indicate that the intervention has not been used as a substitute to improve working conditions.

The study shows that interventions should be shaped to the local needs depending on the social constitution of the worksite. Worksite canteens are important change agents in order to develop and sustain intervention components within healthier eating. Furthermore the results show how embedding of a healthy food intervention demands an on-going interaction between the canteen and other worksite actors.

Healthy eating is a priority in many companies, but the implementation of healthy eating might be regarded as an organizational change process with potential conflicting interests. For example there is disagreement regarding to what extent the worksite should limit food choices for the employees (waste handling, electronic component, and the town hall). The food service environment and managers are important determinants for eating behavior, and more research is needed to determine the role that variance in organization environment plays for the potential of the worksite intervention to make a difference in promoting healthy eating.

Healthier eating interventions are shaped and controlled by the involved local actors' ideas of health and nutrition. Swedish and Danish experiences seem to coincide with foreign experience as regards conditions that promote a successful intervention with a focus on food and work. Internationally there is limited focus on analyses of the organizational conditions' significance for the efficiency of health-promotion at worksites is also consistent with the great majority of the Swedish and Danish literature (Jørgensen et al, 2009).

The experiences so far seems not to have focused on the relations between work, work environment and health. Work environment research indicates that more problems at the worksite are managed within the human resource (HR) field rather than in the work environment field, which could imply a more individualistic approach to worksite health and health in general, where lifestyle is seen as a free and individual choice (Kamp 2007). The good experience with incorporating work-environment as an aspect of health promotion that is reported in an intervention study (Hunt el al, 2005) could be an interesting perspective to consider in future Scandinavian activities

Some studies show good possibilities of promoting healthy food choices at worksite canteens like the '6 a day' F&V intervention and 5 year sustainability study but the need of identifying models of healthy catering practice is obvious (Lassen et al, 2004, Thorsen et al, 2010). The results of the interventions were obtained despite the fact that the social context of the employees (worksite colleges and family) was not directly given a role in the intervention, although a focus is seen as important by Sorensen et al (2004). Worksite colleges may be given a role in discussing the food intake with colleges, but the intervention may get an element of direct social control which may be in contradiction of the local worksite constitution.

Environments as workplaces need to be aware of the significance of improving the nutritional level at worksite canteens. Nevertheless the problems of obesity and inequalities in access to healthy foods need to be addressed not only through individual behavior change, motivation and education, but also through policy and legislation.

Public health policy has to address not only the individual but also the environmental context and conditions where people live and make choices in order to reduce obesity and other nutrition related diseases and improve dietary and lifestyle patterns.

The combination of the social shaping and worksite policy process perspectives on worksite interventions is important to be aware of when planning and analyzing organizational changes, such as promoting healthy eating. We suggest this combined perspective as a model for future interventions. This implies that the planning and analyzing of the intervention should include awareness around important norms and values at the worksite, and former and ongoing cooperation and conflicts among employees and management.

7. Conclusion and recommendations

7.1 The conclusions of the thesis

The questionnaire survey (Paper 1) showed that only 12 % of the participating worksite canteens had healthy meals easily available. The survey also showed that the chances of having a healthy meal were significant higher for an employee at a bigger worksite or an employee at a worksite with a majority of female employees. Furthermore there seemed to be a relationship between the corporate financial support and the availability of healthy meals.

The analyzed F&V intervention was embedded in four of five worksite canteens (Paper 2). The F&V strategies concerning hot meals seemed to be the most successful to sustain and the strategies that give the most F&V per meal (50, 99, 72, 76 and 115 g/meal/customer respectively). The salad bar also seemed some what successful to sustain at four of the canteens (from 60 to 100 g/meal/customer). At the military base the consumption decreased to 26 g/meal/customer. Placing salads at different places at the buffet to reach non-salad eaters seemed to be a successful strategy. The cold dishes did not include much F&V to the total F&V intake/meal and also seemed harder to sustain (from 11 to 32 g/meal/customer). Only the electronic component increased the amount to 68 g/meal/customer. Finally the F&V snack only added from 11 to 23 g/meal/customer except for the electronic component distributor that added 55 g/meal/customer.

The analysis of the F&V intervention (Paper 3) showed that the intervention was shaped in different directions depending on the local context. Healthier eating interventions were shaped and controlled by the involved local actors' ideas of health and nutrition, for example whether the worksite management found it important to support the canteen financially and whether it is necessary to consider the amount of food when it includes a lot of F&V. The analyses show several themes are important to sustainability of an intervention. Contracting out the food supply may challenge the sustainability but may also be a way of ensuring the necessary competences for e more F&V intensive food supply. Structural changes of the worksite, like re-structuring might also challenge the sustainability. Furthermore the engagement of the canteen manager, the ability to develop F&V strategies, and good cooperation with F&V suppliers play important roles. The results also indicated that there is no single best recipe for an intervention, but that interventions should be developed to suit the local needs depending on the social constitution of the worksite. Results also indicated that worksite canteens are important change agents developing and sustaining intervention components within healthier eating. Furthermore the results show how embedding of a healthy eating intervention demands an on-going interaction between the canteen and other worksite actors.

7.2 The perspective of the thesis

From a public health perspective it is important that worksites in general serve meals that are healthy. The worksites need to be aware of the significance of improving the nutritional level and having healthy food easily available since the questionnaire survey (Paper 1) showed that only one out of eight canteens fulfilled the defined health criteria for healthy meals that were used in the study.

Eating habits however correlate with socio-economic conditions of the populations and the worksite. A survey conducted in 2007 from the Danish National Health Agency revealed large inequalities with respect to health promotion at the worksites in relation to branch and geographic region. Moreover in relation to diet and other aspects of lifestyle research also showed inequalities; people with higher education eat healthier and live healthier (smoke less, consume less alcohol and have a higher level of physical activity).

From a public health perspective it is important that healthy meals are easily available at all worksite canteens, no matter if they are public or private, and no matter the size of the worksite or the gender of the employees at the worksite. Additionally there should be equal chances of having a healthy meal no matter the branch or the geographic region in order to reduce the observed inequalities in access to healthy food.

7.3 Some recommendations for future interventions

Future Danish activities within health promotion, including healthier worksite eating, should integrate a focus on work environment in order to combine an individualistic approach with a collective and interest-based approach to health and the role of the worksite. For example by integrating in healthier eating projects a focus on the working conditions and how they influence the eating habits through physical working load and worksite stress. The project Food at Work has shown that in order to promote healthier eating at worksites establishing of partnerships between worksite management, canteen and employees is important (Lassen, 2005). Also the '6 a day' Canteen Model Study was based on a partnership between the canteen manager, the canteen staff and the project team but the project did only indirectly include the management and the employees at the worksite in the project. Improvement of the dietary intake for the employees at work might include not only the employees and their colleagues at the worksite but also the families of the employees in order to make the F&V intervention more successful.

The results of this thesis point to the need for a more widespread implementation of strategies that promote healthier eating at worksite canteens. The results indicate that a worksite intervention needs to be tailored to the needs of the particular worksite environment in which it is implemented.

Furthermore this tailoring needs to be done in close partnership among the local stakeholders in order to ensure interaction with the conditions at the particular worksite in which it is implemented.

The combination of the social shaping and worksite policy process perspectives on worksite interventions is important to be aware of when making organizational changes, such as promoting healthy eating. I suggest this combined perspective as a model for future interventions. This implies that the planning of the intervention should include awareness around important norms and values at the worksite, and former and ongoing cooperation and conflicts among employees and management.

Based on the experiences from the long-term embedding of the F&V worksite interventions I recommend that future intervention programs addressing worksite canteens are based on:

Participatory approach involving worksite employees and management, and canteen staff and management

Long-term intervention enabling embedding of new practice

Awareness about worksite history, including cooperation and conflicts among employees and management

Dialogue with suppliers about assortment and quality

Networking among involved worksite canteens in order to exchange experience

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List of papers

This thesis includes three papers, referred to in the text by their short names.

Paper 1: Workforce gender, company size and corporate financial support are predictors of availability of healthy meals in Danish worksite canteens

Anne Vibeke Thorsen, Anne Lassen, Jens S. Andersen and Bent Egberg Mikkelsen

Public Health Nutrition (2009): 12 (11), 2068-2073

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Short name: Healthiness of canteens

Paper 2: Long term sustainability of a worksite canteen intervention of serving more fruit and vegetables

Anne Vibeke Thorsen, Anne Dahl Lassen, Inge Tetens, Ole Hels and Bent Egberg Mikkelsen

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Short name: Sustainability

Paper 3: Strategies to promote healthier eating at worksites – analysis of experiences from a social shaping perspective

Anne Vibeke Thorsen and Michael Søgaard Jørgensen

Draft

Short name: Social shaping

Papers

Paper 1: Healthiness of canteens

Workforce gender, company size and corporate financial support are predictors of availability of healthy meals in Danish worksite canteens

Anne Vibeke Thorsen, Anne Lassen, Jens S. Andersen and Bent Egberg Mikkelsen

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Workforce gender, company size and corporate financial support are predictors of availability of healthy meals in Danish worksite canteens

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Abstract

Objective: Environmental strategies at worksites may help consumers change dietary behaviour towards a more healthy diet. The present study aimed to evaluate the availability of healthy meal options at Danish worksite canteens and to identify predictors of worksite canteens providing healthy meals.

Design: A self-administered questionnaire was randomly mailed to 1967 worksite canteen managers. Besides information and characteristics about the canteen and the worksite, the canteen managers specified the menus available. Two different health groups (Healthy and Less Healthy) were defined in three different meal categories (Sandwiches, Hot meals and Salads) as well as a combined category (Combined) combining all the three meal categories. The characteristics of the worksites were compared with regard to the different health groups.

Setting: Randomly selected Danish worksite canteens.

Subjects: 553 Danish worksite canteen managers replied, resulting in a response rate of 29%.

Results: Only 12% of the canteens applied to the Healthy group combining all the three meal categories. In particular, worksites with more than 75% female employees served healthy menus on a frequent basis. The size of the worksite was positively correlated with more healthy meal options. Furthermore, the present study suggests a positive relationship between corporate financial support and the availability of healthy meal options.

Conclusions: Among the selected variables studied, workforce gender, company size and corporate financial support were significant predictors of the availability of healthy meal options in worksite canteens. More research is needed on the role that variance in organisation environment plays for the potential of worksite intervention, to make a difference in terms of healthy eating.

Keywords
Healthy eating
Worksite
Corporate dining
Nutrition

Poor eating and physical activity habits are the main causes in the development of the increasing prevalence of overweight and obesity in the Nordic countries, as well as other regions[1–3]. Worldwide, the incidence of obesity has increased over the last 30–40 years, and so has the incidence of nutrition-related diseases such as diabetes type 2. According to WHO, the obesity epidemic is one of the most serious threats to public health, and, worldwide, there are now more people overweight than underweight[4]. Together with a high intake of dietary fat, a low intake of fruit and vegetables was among the ten top selected risk factors for global mortality[4].

Population groups of lower social economic status have the highest rate of obesity in the USA as well as in other industrialised countries. The observed inequities in access to healthy food have external costs to society, since the consumption of energy-dense diets has been linked to higher rates of obesity, diabetes type 2 and the metabolic syndrome[5,6]. In order to prevent obesity, public health policies have to improve access to healthier foods – especially for the groups with lower educational level[7]. An obvious strategy option might be to improve nutrition in settings such as workplaces, neighbourhoods and schools[5,6,8]. Environmental strategies, such as increasing the availability of healthy food and reducing barriers towards healthy eating, may help consumers change dietary behaviour and meet the guidelines for a healthy diet.

The settings approach has gained increasing attention since the Ottawa Charter was adopted in 1986[8]. Furthermore, the workplace is a setting where it is feasible to reach individuals normally hard to reach[6,9].

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Worksite canteens supply meals for a regular clientele, and in many cases the meal may constitute the main meal of the day. Seen from the worksite point of view, the protection of human resources through health promoting activities offers obvious advantages. Several policy papers, including the WHO second Nutrition Action Plan 2007, the EU White Paper 2007 and the Istanbul Charter 2006, call for action to be taken in the workplace eating environment[10–13]. However, these policy documents are very limited in scope when it comes to pointing out how the interventions are to be carried out, nor do they relate to the role that the type and organisation of the worksite might play[14,15]. Thus, there is a need to study the role that variance in organisation environment plays for the potential of worksite intervention to make a difference in terms of healthy eating.

The aim of the present study was to evaluate the availability of healthy meal options at Danish worksite canteens. Further, the specific objectives were to assess the characteristics of the worksite canteens being categorised as healthy, compared to those categorised as less healthy.

Material and methods

A self-administered questionnaire was mailed to 1967 canteen managers randomly selected among available records from the database of the Canteen Managers Association in Denmark – in total, 3799 members. The mailed questionnaire included a stamped self-addressed envelope. No reminder was later sent for the non-responders since the questionnaires were mailed-in anonymously. Seventy-five questionnaires were returned to sender on account of address unknown or survey irrelevant. The relevance of the questionnaire was assessed by a group of experts, and it was pilot tested and revised to improve clarity to respondents.

The questionnaire survey focused on the nutritional quality of the menu options available at the canteen. The canteen managers were asked to specify the menus available at the canteen and characteristics about the canteen and the worksite. Based on the Nordic Nutrition Recommendations[16], a total of thirteen questions from the questionnaire regarding the menus available at the canteens were selected as indicators of the nutritional quality of the menus. The nutritional focus was the availability and content of menu options being rich in fruit and vegetables, fish dishes, reduced-fat menus as well as the free choice of high-fat ingredients such as butter and mayonnaise, and, finally, the availability of free chilled water. Except for providing free chilled water, the questions fell into three categories: Sandwiches, Hot dishes and Salads. Fruit and snack vegetables were included in the Salad category. Questions could be answered either as a yes or no answer or as a frequency of serving selected menu items, the answers being daily, 3–4 times a week, 4–8 times a month and seldom or never.

Table 1 Assignment of the health category Healthy (H) to different meal categories according to selected indicators of the nutritional quality of menu items available at the canteen

Meal option	Healthy options (H)
Sandwich	Options of fish and vegetable fillings at least 3–4 times a week In addition, a choice of no butter and no mayonnaise
Hot meal	Meal according to plate model* at least 3–4 times a week
Salad	Availability of daily salad. Also, availability of fruit (in pieces or whole) or snack vegetables at least 3–4 times a week
Combined	Combining all three menu options (Sandwich, Hot meal and Salad) as well as availability of free chilled water daily

*A plate model is a plate served according to the official nutritional recommendations. 1/5 of the plate is meat, cheese, fish and eggs, 2/5 of the plate fruit and vegetables, 2/5 of the plate is rice, potatoes and bread.

Questions regarding the characteristics of the worksites (explanatory variables) included number of employees at the worksite and at the canteen (canteen staff), number of lunches served on a daily basis, serving system (either a buffet system, where a variety of food choices are offered at a fixed price or a cash *á la carte* canteen where the customers select and purchase the items for lunch, or a combination of the two serving systems), town *v.* countryside, canteen outsourced *v.* operated by the worksite, presence of a food and nutrition policy, job functions at worksite (four categories on level of sedentary work), canteen subsidised or not (food products, equipment and/or salary, respectively), and percentage of male employees at worksite (four categories of male/female employees).

The health criteria were constructed on the basis of the answers to the thirteen questions on the nutritional quality of the menus. See Table 1 for an overview. The suitability of the health criteria was assessed by a group of experts in relation to its intended purpose, and the content validity was examined in terms of how well it corresponded qualitatively with the dietary recommendations. Furthermore, the 'Plate Model' (a meal model illustrating the composition of a recommended meal) was chosen as a useful model in a slightly modified form, focusing on the relative proportions of meal components as served; for example, double amount of fruit and vegetables compared to meat, etc. The self-declared menus were evaluated and categorised into two groups depending on the relative nutritional quality of the menu options – Healthy (H) and Less Healthy (LH). More specifically, the *Sandwich* was labelled H, if options of fish and vegetable fillings were available 3–4 times weekly or more. In addition, no butter and mayonnaise option for category H was required. Regarding the Hot dish category, the label H was applied if an option of a 'plate model' (a meal model illustrating the composition of a recommended meal) was available at least 3–4 times weekly. Considering

the Salad category (including fruit and snack vegetable), the label H was assigned if salad was available on a daily basis as well as fresh fruit in pieces, fresh fruit whole or serving of snack vegetables 3–4 times a week.

A canteen fulfilling all of the mentioned options regarding all three categories, as well as providing free chilled water daily, was categorised as overall Healthy (H Combined). A canteen serving the selected menu options 3–4 times a month, less or never would be labelled as overall Less Healthy (LH Combined).

Statistics

A large number of explanatory variables from the questionnaire were investigated with respect to their possible relation to four dichotomous dependent variables (H with respect to Sandwiches, Hot Meals, Salads and Combined) in separate multiple logistic regression analyses. This procedure raises a multiplicity issue. Since the study was explorative, the following solution was adopted. Initially, to select variables for each of the four multiple logistic regressions, all categorical explanatory variables were tested using Fisher's Exact Test[17] and all continuous explanatory variables (and a $\log_{10}$ transformation) were tested in a logistic regression. All explanatory variables with a *P*-value below 0·2 were included in the multiple analyses. The threshold of 0·2 was chosen to include all related variables and at the same time avoid including too many variables and thereby cause co-linearity problems in the regression analyses. Furthermore, all two-way interactions were included. Reduction of the regression model was done with a likelihood ratio test at a 1 % significance level. The low significance level was selected to partly correct for the multiplicity issue. Fisher's Exact Test was done in *R*[18] and the logistic regressions were done in S-PLUS[19].

Results

In total, 553 responded to the questionnaire, resulting in a response rate of 29 %. In the present survey, an average worksite canteen on a daily basis provided meals for 160 customers and on average had 4·2 employees. Seventy per cent of the canteens had a buffet system (only, or in combination with a cash system), whereas 48 % had a cash system (only, or in combination with a buffet system). Twenty-three per cent of the canteens stated to have a nutrition policy (results are not shown).

Table 2 shows the percentage of canteens in the survey being categorised as Healthy (H). The meal options analysed in the present study consisted of Sandwiches, Hot meals, Salads and Combined.

The majority of the canteens (85 %) had salad available on the menu on a daily basis, as well as either fruit or snack vegetables 3–4 times a week, but only 12 % had all the three meal options available in the Combined Healthy category (H Combined). Looking at Sandwiches and Hot Meals, 25 % and 58 %, respectively of the canteens had healthy sandwiches and healthy hot meals (H) available.

Table 2 The number of canteens being categorised as Healthy (H) for each meal options available at the canteens (Sandwich, Hot meal, Salad and Combined)

Meal option	Number of canteens	Percentage of 553 (total *n*)
Sandwich	136	25
Hot meal	323	58
Salad	470	85
Combined	69	12

Table 3 shows the results from the multiple regression analysis on the data investigating a number of explanatory variables. Looking overall at the characteristics of the worksites, especially the following variables seemed to explain the differences in availability of healthy menu options. The size of the worksite played a role; the bigger (in terms of number of lunches served on a daily basis), the higher the OR of serving healthier menu options (significant in all H categories with an increase in OR of 2·1–2·6 for an increase of 1 on the $\log_{10}$). Furthermore, corporate financial support of the canteen played a role – canteens being subsidised had significantly higher odds of serving healthy menu options for two of the tested categories, including the H Combined category (OR 2·0–2·6 in favour of subsidised products). Having a nutrition policy seemed to influence the odds of belonging to the Healthy category (H Sandwich), but only with regard to sandwiches. Having a nutrition policy positively interacted with the size of the worksite, and the increase in OR (as a function of number of lunch served at worksite) was higher if the worksite had a nutrition policy. Finally, the employee profile seemed to influence the availability of combined healthy options at the canteen with respect to the sex distribution. Worksites with less than 25 % male employees had fourteen times higher odds of being overall healthy, compared to worksites with more than 75 % male employees (H Combined).

Discussion

The present study is the first published Danish study to focus on the role that the type and organisation of the worksite might play in terms of healthy meal options. In an international context, Sorensen *et al.*[20] conclude, when reviewing worksite interventions, that research is needed on the mechanisms of organisational change and the processes that influence dietary changes in order to understand employee, worksite and vendor needs. In 1995, The Working Well Trial study pointed to the potential power of organisational characteristics and cultural norms, where the baseline survey gave insights into how the individual and organisational systems are likely to influence behaviours and corporate culture[21].

Table 3 Predictors of availability of healthy meal options: results from the multiple logistic regression analysis investigating the relationship between the health category Healthy (H) for each meal option and various explanatory variables

Meal option	Variable	OR	95 % CI	*P*-value
Sandwich	Subsidised *v.* not subsidised*	2·0	1·2, 3·4	0·0079
	Nutrition policy Yes × Number of lunch served†	2·6	1·5, 4·6	0·0006
	Nutrition policy No × Number of lunch served†	2·1	1·2, 3·6	
Hot meal	Number of lunch served‡	2·4	1·4, 4·2	0·0024
Salad	Number of lunch served‡	2·4	1·2, 5·0	0·0038
Combined meal options‖	Subsidised *v.* not subsidised*	2·6	1·4, 5·0	0·0037
	Number of lunch served‡	2·6	1·3, 5·3	0·0084
	(0–25)% men *v.* (75–100)% men§	14·0	3·2, 99·5	0·0012
	(25–50)% men *v.* (75–100)% men§	7·7	2·1, 50·6	
	(50–75)% men *v.* (75–100)% men§	6·9	1·9, 1·4	

*If the worksite is subsidising the canteen or not.
†Log_{10} (number of lunches served per day) stratified on whether the workplace has a nutrition policy.
‡Log_{10} (number of lunches served per day).
§Percentage of men at the worksite.
‖Combining all three meal options (open sandwiches, hot meals and salads).

From a public health perspective, it is important that worksites in general serve meals that are healthy and easily available for the customer to select. The results from this survey show that only about one out of eight of the participating canteens fulfilled the defined health criteria for combined meal options, so the health-oriented customers have to select carefully in order get a healthy meal. This is especially true if they are having sandwiches. Only one of every four of the canteens in the present study was categorised as having healthy (H) sandwiches available. A recent Danish report looking at meals offered at worksite canteens also looks into the nutritional quality of a Danish open sandwich. The report concludes that sandwiches as well as open sandwiches are very low in fruit and vegetable content; open sandwiches, especially, are high in fat content but also high in dietary fibre because of the rye bread. Danish open sandwiches may therefore be healthy in some aspects but less healthy in other aspects[22].

Looking at the characteristics of these worksites, the female dominated worksites (more than 75 % female employees) had healthier meals available. Other studies have shown that men, compared to women, are less health conscious and consume fewer fruits and vegetables[20,23]. However, it has also been shown that easy access to attractive fruit- and vegetable-rich products, including salads, can significantly increase the intake among both men and women[23].

The size of the worksite also plays a role; the bigger the worksite, the more healthy are the meals available. This is in line with studies showing that employees in smaller companies have limited access to participate in health promotion programmes[24]. Furthermore, the present study showed a relationship between both corporate financial support of the canteen (subsidising the meals), as well as having a nutrition policy and the availability of healthy meal options in the canteens. Having a nutrition policy seems to affect only the availability of healthy meal options in regard to sandwiches. Otherwise, in the present study, having a nutrition policy had no significant influence on the availability of healthy meal options at the canteen.

Healthy eating is a good investment for companies since it may improve employee satisfaction, as well as have an impact on recruitment and increase efficiency at the worksite[25]. In addition, food served at worksite canteen may serve as a model of an optimal meal also influencing people's food choices on other occasions[25,26]. However, the caterer must also supply food that the consumer wishes to eat; thus, for a healthy meal to be consumed, it must both be available and selected[27]. Promoting healthy eating at worksites has been claimed to be easier towards white-collar workers than blue-collar workers, since blue-collar workers are less likely to participate in health promotion programmes[28,29]. Interventions at worksites do not require individuals to self-select into the defined programmes and therefore interventions at the worksite setting make it possible to reach the individuals normally hard to reach, e.g. the blue collar workers and men with a limited education. But the workers will not select the healthy meals if they are not appealing. Therefore, the employee demand for healthy food choices is a fine balance between price, benefits, taste and convenience[20,30]. Knowing that men with a limited education are more likely to have unhealthy eating habits among other risk factors, the implications of the present study would be to subsidise the worksite canteens with a majority of men, and especially worksites employing men with a limited education, with the goal of making healthier meal options available.

From a public health perspective also, the smaller worksites should have more healthy meal options easily available. Subsidising healthy food choices is one strategy to promote healthy dietary habits. It has been shown that taste, place and verbal encouragements are also the factors that influence the food choice in the canteen, and that support and commitment from management are other determinants for successful worksite interventions for blue-collar as well as white-collar workers[20,28]. Meiselman *et al.*[31] showed that the food environment

is important to food acceptance, where food served in a cafeteria was deemed less appetising than food consumed in a restaurant.

In this survey, only 12 % of the participating canteens were categorised as having healthy meals available in all menu options (H Combined) at least 3–4 times weekly. Likewise, Lachat *et al.*[32] found that only 5 % of the meals available at a university canteen in Belgium complied with the optimal nutritional profile. In Australia, Burns *et al.*[33] have found that meals consumed outside the home can make a significant contribution to the fat content of the diet. Comparable findings are reported in another study of Danish worksite cafeterias, where Lassen *et al.*[23] evaluated the nutritional composition of worksite canteen lunches. In general, the meals served were too high in fat and too low in fruit and vegetables. On the contrary, Roos *et al.*[26] found that those having lunch at a staff canteen were more likely to follow the recommended food guidelines. In Finland, lunch is usually a cooked meal including bread and fresh vegetables within the price of the meal.

Even though the worksite canteens seem to be a promising setting for promoting healthy eating[26,34–36], there is limited knowledge on how healthy eating can be promoted most effectively at the workplace. Taking into account that previous studies[23,32,33,37] have found that meals consumed outside the home can make a significant contribution to the fat content of the diet, it is important that the daily meals at the worksite canteen comply with minimum nutritional recommendations. Especially for caterers who supply meals for regular clientele such as workplace canteens, where the meal may constitute the main meal of the day, there is a special obligation to supply healthy options. Therefore, the Committee of Experts on Nutrition, Food and Consumer Health proposed, in 2008, to work on recommendations on promoting healthy eating habits at workplaces[38].

Several study limitations should be noted. The present study is based on a self-administered questionnaire that could be subject to response bias. The response rate was 29 %, but since the survey was a self-administered mailed questionnaire and no follow-up by phone or e-mail was done, the response rate seems reasonable. A similar low response rate, 30 %, was reported in another canteen survey from Denmark[39] in 1995. The low response rates could possibly reflect the fact that canteens are not core businesses at the worksite, so the willingness to participate in surveys might be limited. The low response rate is a weakness but this is normally a challenge when studying organisations[14,15]. We have no data available on worksites belonging to either the private or public sector. Furthermore, we have no information on price strategies or on how many menu items are actually being sold, but only the availability of menu items. Also, we have no data on the actual nutritional quality of the meals served, and the questionnaire is not validated for sensitivity to discriminate between healthy and less-healthy meals.

The present study also has several strengths. The focus of the study is on the managers' description of the meals available in the canteens and on the characteristics of the worksite and its workforce. Very few studies have that focus and acknowledge that the food service environment and the food service managers are important environmental determinants for eating behaviour.

In conclusion, the present study, examining the availability of healthy meal options in Danish worksite canteens, shows that the canteens have room for improvement in order to promote healthier food choices, since only 12 % of the canteens fulfilled all of the health criteria set up in this study. However, assessment of the consumer nutrition environment at worksite canteens is challenging because of the complexity in the range of food choices. Environments such as workplaces need to be aware of the significance of improving the nutritional level at worksite canteens and having healthy food choices easily available. Eating habits, however, correlate with educational and socio-economic conditions of the population and thus it is likely that the perspectives in promotion of healthy eating at worksites also depend on the type of worksite. The present study showed that the chances of having a healthy meal were significantly higher for an employee at a worksite with a majority of female workers or for an employee at a bigger worksite. Also, there seems to be a relationship between the financial support of the company and the availability of healthy meal options at the canteen.

The present study is a step towards evaluating and categorising worksite canteens according to the availability of healthy food choices. The food service environment and managers are important determinants for eating behaviour, and more research is needed to determine the role that variance in organisation environment plays for the potential of the worksite intervention to make a difference in promoting healthy eating.

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Paper 2: Sustainability

Long term sustainability of a worksite canteen intervention of serving more fruit and vegetables

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Long-term sustainability of a worksite canteen intervention of serving more fruit and vegetables

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Abstract

Objective: To analyse the 5-year sustainability of a worksite canteen intervention of serving more fruit and vegetables (F&V).
Design: Average F&V consumption per customer per meal per day was assessed in five worksite canteens by weighing F&V served and subtracting waste. Data were collected by the canteen staff during a 3-week continuous period and compared to data from the same five canteens measured at baseline, at end point and at 1-year follow-up. The intervention used a participatory and empowering approach, self-monitoring and networking among the canteen staff, management and a consultant. The method focused on providing ideas for increased F&V for lunch, making environmental changes in the canteens by giving access to tasteful and healthy food choices and reducing the availability of unhealthy options.
Setting: Five Danish worksites serving from 50 to 500 meals a day: a military base, an electronic component distributor, a bank, a town hall and a waste-handling facility.
Subjects: Worksite canteen managers, canteen staff.
Results: Four of the five worksite canteens were able to either maintain the intervention or even increase the consumption of F&V. The average increase from baseline to 5-year follow-up was 95 g per customer per meal per day (18, 144, 66, 105 and 141 g, respectively). On average, the five canteens at the long-term follow-up had an F&V consumption of 208 g/meal per customer.
Conclusions: The present study indicates that sustainability of F&V is possible in worksites where the participatory and empowering approach, self-monitoring, environmental change, dialogue with suppliers and networking among worksite canteens are applied.

Keywords
Sustainability of intervention
Worksite canteens
Fruit and vegetables

A poor diet and physical inactivity are linked to a number of diseases and disorders and are estimated to be among the main causes for the growth in overweight and obesity among the adult population. Increasing the intake of fruit and vegetables (F&V) is considered to be likely to reduce the burden of chronic diseases worldwide[1–4].

The worksite is a unique setting since it reaches a large proportion of the adult population including those unlikely to engage in a preventive health behaviour programme[5–8]. The settings approach to promote healthy eating has been growing in importance ever since the Ottawa Charter for health promotion was adopted in 1986[9]. But since the Charter was adopted, it has been reshaped by many groups and individuals. There is evidence and also a framework from the literature reflecting on more critical ideas and action to help make health promotion more sustainable by targeting the interventions to the specific settings[10–13].

A number of intervention studies at worksite settings have shown that it is possible to increase F&V intake among employees[14–18]. The same conclusion is found in systematic reviews analysing the evidence on effectiveness and programmes promoting F&V intake in adults[6,19,20], but little is known about the long-term persistence of these changes, especially after the intervention has ceased. An initial implementation success does not necessarily predict a sustained effect of the intervention[21]. There seems to be a lack of consensus about the conceptual and operational definitions of sustainability in the literature[5,6,8,10,12,22,23]. The concept of sustainability refers to the continuation of programmes[11].

The original '6 a day' Worksite Canteen Model Study investigated the effect of a 6-month intervention on the F&V consumption in five Danish worksite canteens. The original intervention was based on a participatory and empowering approach, self-monitoring and included networking among canteens. Results showed significant increases for all five canteens from baseline to end point, and this increase was found to be either maintained or

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increased (for the bank and the waste-handling facility) after a 4-month follow-up period[16].

The objective of the present study was to return to the same worksites 5 years after the F&V intervention initially started and analyse the long-term sustainability of the intervention.

Materials and methods

Worksite recruitment and characteristics

The canteen managers at the five Danish worksites who participated in the '6 a day' Worksite Canteen Model Study in 2001[16] were asked by e-mail to participate in the 5-year follow-up study in 2006. All five canteen managers agreed to participate. As previously described[16], the worksites were initially selected to vary with respect to employee profile (gender and age) and occupation (sedentary/physically exacting work). Regarding the worksite characteristics, data are obtained by interviewing the management and the canteen managers at the worksites. The number of customers at the worksite canteens was obtained from the baseline assessment in 2001[16] or from the 5-year follow-up assessment in 2006.

Monitoring the consumption of fruit and vegetables

The 5-year follow-up data collection consisted of 3 weeks (Monday–Friday) of daily and continuous weighing of all F&V consumed at the worksite canteens, as well as measuring the exact number of customers each day. In order to avoid seasonal variation of F&V intake, the data collection was conducted in the same months as the baseline in the intervention study (January–February). Therefore, the data collection was conducted exactly 5 years after baseline monitoring and 4 years and 4 months after end-point monitoring.

The data collection procedure was the same as the '6 a day' Worksite Canteen Model Study. In brief, the canteen staff were given the responsibility for measuring the consumption of F&V and the exact number of customers. The records were divided into five weekdays and provided the listing of all F&V that were prepared for serving. Furthermore, the records were divided into four meal categories that were weighed individually, because typically these dishes were prepared separately or at different periods during the working hours: hot dishes, cold dishes, salad bar and fresh fruit plus vegetable-based snack. The amount of F&V not sold was deducted so that the average amount of F&V per lunch meal served per customer per day could be calculated. The number of customers was counted at each worksite in different ways depending on the worksite and its meal service system, either by counting using the cash register system or by counting trays. All the completed records were checked by the main author (A.V.T.) shortly after the 3 weeks of data collection and low or high records were examined for discrepancies.

Method developed and performed at the original '6 a day' intervention study

In the original '6 a day' Worksite Canteen Model Study, the canteen staff and management in five worksites were involved in defining the scope of activities and implementation[16]. The canteen staff and management worked closely with the project team. The project used the tools of continuous quality improvement as a background construct, including canteen staff involvement and ownership and problem solving driven by measurable data[24,25]. Baseline measurements (grams of total F&V consumption per lunch meal per customer) were followed by 8 h training, goal setting and strategy development by the staff and managers at each canteen. End-point measurements were performed 6 months after the beginning of strategy development, and follow-up measurements were performed within 1 year from baseline (4 months from end point). After the baseline measurements, a period of 2 months was spent preparing the F&V intervention, goal setting, deciding on F&V strategies and running courses for the staff. The 6-month intervention was followed by a 4-month period of no F&V measurements before the 1-year follow-up was conducted. Furthermore, during the period of intervention, achievements at the canteens were shared in short newsletters and the canteen managers were encouraged to network with other canteens managers in order to share ideas and support each other.

Statistics

In order to test differences in intake between points in time (baseline, end point, short-term follow-up and long-term follow-up), a repeated measures ANOVA was performed with F&V intake as the dependent variable (g/meal per customer), canteen sites (military base, electronic component distributor, bank, town hall and waste-handling facility), and points in time (baseline, end point, 1-year follow-up and 5-year follow-up) were evaluated as independent fixed variables. Both main effects and interactions were evaluated. Statistical comparisons between points in time within worksites were performed by pairwise *t* tests under repeated measures ANOVA. Spatial power was initially used as a covariance structure allowing for different distances between points in time. As the use of compound symmetry made no difference compared to spatial power and had the advantage of a lower Akaike's Information Criterion, compound symmetry was chosen as the covariance structure in the final model[26]. Homogeneity of variance and normal distribution of residuals were investigated by plots and histograms of residuals. Shapiro–Wilk's test for normal distribution was performed. Statistical analysis was performed using the procedure 'MIXED' in the Statistical Analysis System software package, SAS Enterprise Guide version 3·0 (SAS Institute Inc., Cary, NC, USA). Descriptive data are

presented as means and standard deviations and results are presented as means with their standard errors.

Results

Workplace characteristics

The characteristics of the worksite regarding the profile of the employees are shown in Table 1. All worksites had in-house food service facilities and served from 50 to 500 customers on a daily basis. The worksites were a military base, an electronic component distributor, a bank, a town hall and a waste-handling facility. At two worksites, the majority of the employees were women (the bank and the town hall), two worksites had a majority of employees under 40 years of age (the military base and the electronic component distributor) and two worksites had a majority of employees with physically exacting work (the military base and the waste-handling facility). Two worksites were public and two were private and the last one was semi-public. Furthermore, one canteen (the town hall) served organic meals and has an official organic certification. None of the five canteens was run on a for-profit basis and they were all financially supported by the worksite (the military base worksite to a lesser extent than the other four worksites).

Changes at the worksites and the canteens from baseline to long-term follow-up

The average number of customers in the worksite canteen at baseline and long-term follow-up is shown in Table 1. In general, all five worksites had fewer customers on average at the long-term follow-up measurement compared with the baseline measurement. There were different reasons for fewer customers at the 5-year follow-up compared with the baseline. There were fewer external customers working at the electronic component distributor, the waste-handling facility and the town hall. The electronic component distributor and the bank downsized, and the military base reduced its numbers due to organisational change.

At baseline, four of the worksites had a cash system, where customers selected and purchased different items for lunch, and one had a buffet system, where a variety of food choices were offered at a fixed price. At the 5-year follow-up assessment, four out of five worksites had a buffet system and only one kept the cash system (the military base). All five canteen managers and the majority of the staff at all five worksites were the same at the 5-year follow-up measurement as at the baseline study. One of the worksites (the bank) had outsourced the canteen facility to an external catering company but kept the canteen manager and almost all staff in-house. Another worksite (the waste-handling facility) had an external caterer to cater the lunch and in-house staff to serve lunch and a third worksite (the military base) had a request for proposal to contract out the business.

Table 1 Characteristic of the five worksites in 2006 and characteristics of the worksite canteens in 2001 and 2006

					Caterer system†		Meal service system†		Number of customers‡	
Worksite characteristics*	Private/public	Age in years	Gender	Physically exacting or sedentary	2001	2006	2001	2006*	2001	2006
Military base	Public	Majority < 40	Male	Majority physically exacting	In-house	RFP to contract out	Cash	Cash	190	148
Electronic component distributor	Private	Majority < 40	Male	Majority sedentary work	In-house	In-house	Buffet	Buffet	140	54
Bank	Private	Majority > 40	Female	Majority sedentary work	In-house	Outsourced	Cash	Buffet	370	262
Town hall	Public	Majority > 40	Female	Majority sedentary work	In-house	In-house	Cash	Buffet	136	123
Waste-handling facility	Semi-public	Majority > 40	Male	Majority physically exacting	In-house	External	Cash	Buffet	73	55

RFP, request for proposals to contract out the business.
*Characteristics of the worksite regarding age, gender and physically exacting or sedentary work are based on information from worksites.
†The caterer and the meal service system are information from the baseline (2001) and the 5-year follow-up measurements (2006).
‡The number of customers are results from the baseline assessments (2001) and the 5-year follow-up (2006).

Consumption of fruit and vegetables

Table 2 shows the total lunch F&V consumption per customer over time for each of the five worksites. In one case (the waste-handling facility), food was only weighed for 2 weeks (n 10) due to inadequate canteen staff capacity and holidays. The staff at the remaining four canteens monitored the F&V during the 3 weeks (n 15).

On average, the canteens at the baseline had an F&V consumption of 113 g/meal per customer (69, 168, 112, 118 and 99, respectively), which increased to an average of 181 g/meal per customer ($P < 0{\cdot}001$ for four worksites and $P = 0{\cdot}01$ for the electronic component distributor) at the end point (139, 222, 151, 205 and 192, respectively). The average F&V consumption at the 5-year follow-up was maintained at the level of 208 g/meal per customer (87, 312, 178, 223 and 240, respectively). Overall, a net average increase of 95 g of F&V per customer per day was achieved from baseline to the 5-year follow-up measurements for the five worksites. One of the worksites (the military base) failed to sustain the increase in F&V consumption obtained from the baseline to the end point. At the military base, an insignificant increase of 18 g per customer per day compared to the baseline was seen ($P = 0{\cdot}28$) at the 5-year follow-up measurements. All the other four worksites increased the F&V consumption significantly from baseline to the 5-year follow-up measurements ($P < 0{\cdot}001$).

One of these four worksites further increased ($P < 0{\cdot}001$) its F&V consumption significantly from both the end point and the 1-year follow-up to the 5-year follow-up measurements (the electronic component distributor increasing from 222 to 228 to finally 312 g/meal per customer). As no significant differences in F&V consumption were seen from the end point to the 5-year follow-up measurements in the bank, the town hall and the waste-handling facility, these worksites sustained the increased F&V consumption (see Table 2).

Discussion

The major finding of this long-term sustainability study was that overall the worksite canteens participating in the '6 a day' Worksite Canteen Model Study were still, 5 years after the start of the intervention, able to sustain the increased consumption of F&V.

The five canteens on average increased the F&V consumption from baseline to the 5-year follow-up by 95 g per meal per customer. However, the present study also showed that some sites were more successful than others. A significant increase from baseline to 5-year follow-up ($P < 0{\cdot}001$) was shown in four out of the five worksites (see Table 2). Only one worksite did not sustain the increased F&V consumption achieved during the intervention and almost returned to the baseline F&V intake. Here, F&V intake decreased by 52 g/meal per customer from the end point to the 5-year follow-up measurements ($P = 0{\cdot}002$) and increased insignificantly from the baseline ($P = 0{\cdot}28$).

The sustainability of interventions is found to be a central challenge in public health promotion related not only to the worksite setting, but also in health promotion in general[5,6,8,12,22,23]. Relatively few empirical studies are published in this area[7,22,23,27] and the health interventions often fail to consider the programme as complex systems that operate dynamically with the programme, the key stakeholders and the broader community environment[11,12,28].

In a review of programme sustainability for health-related programmes in the United States and Canada, the factors contributing to greater sustainability were examined[27]. Five factors were found to be important in influencing the extent of sustainability; if a programme can be modified over time, a champion is present, a programme fits with its organisation's mission and procedure, benefits to staff members and/or clients are readily perceived and stakeholders in other organisations provide support. The finding is supported by O'Loughlin *et al.*[22] when investigating the sustainability of health promotion interventions in qualitative case studies. Furthermore, Lassen *et al.*[16] suggested similar factors influencing the sustainability of the '6 a day' Worksite Canteen Model Study. The method developed during the '6 a day' Worksite Canteen Model Study focused on co-operation between a consultant and the canteen staff and management in defining, planning and implementing the F&V intervention. The method also focused on providing ideas for increasing F&V for lunch, making environmental

Table 2 F&V consumption at baseline, end point, at 1-year follow-up and at 5-year follow-up at each canteen

	F&V consumption (g/meal/customer)													
	Baseline intake				End-point intake			1-year follow-up intake			5-year follow-up intake			
	Mean	SE	d*	n†	Mean	SE	d*	Mean	SE	d*	Mean	SE	d*	n†
Military base	69[b]	12	15	190	139[a]	12	15	147[a]	14	10	87[b]	12	15	148
Electronic component distributor	168[c]	12	14	140	222[b]	12	15	228[b]	12	15	312[a]	12	15	54
Bank	112[c]	12	15	370	151[b]	12	15	198[a]	12	15	178[a,b]	12	15	262
Town hall	118[b]	12	15	136	205[a]	13	13	188[a]	14	10	223[a]	12	15	123
Waste-handling facility	99[d]	14	10	73	192[c]	12	15	281[a]	12	15	240[b]	14	10	55

[a,b,c,d]Mean values within a row with unlike superscript letters were significantly different.
*Number of days of monitoring at each canteen.
†Number of customers at each canteen, results from baseline assesments (2001) and results from 5-year follow-up assessments (2006).

changes in the canteens by giving access to tasteful and healthy food choices and reducing the availability of unhealthy options[16]. We believe that some of the key elements for sustaining this tailored intervention were management involvement, empowering the canteen staff, getting everyone in the canteen involved in a proactive way and providing networking opportunities between canteen managers. Furthermore, the goals and strategies of worksite interventions were decided individually by each of the canteens' staff. All staff members participated in monitoring, goal setting and decision making, which increased their commitment to the project.

It is crucial not only to identify and address barriers but also to enhance facilitators of organisational and environmental changes within worksites[29]. The novelty value of the present study lies in the involvement of the canteen staff already in the initial steps of the intervention. In the initial steps, the canteen staff were asked to customise the monitoring procedure of F&V amounts, to set their *own* goals and to develop F&V strategies in the four categories (hot dishes, cold dishes, salad bar and F&V snacks). The intervention acknowledges that for both the intervention components and outcome measurements to make sense they must be embedded deeply in the daily routines of the staff at the canteen.

The five worksites were different with respect to gender, age, physically exacting/sedentary work (see Table 1). Two worksites were private, two were public and one was semi-public. Four worksites had a buffet meal service system and one had a cash system (the military base). Two worksites had an in-house caterer, two had an external caterer and one had an in-house caterer with a request for proposals to contract out the business (the military base). The F&V consumption at the canteens at baseline varied from low at the military base (69 g/meal per customer) to high at the electronic component distributor (168 g/meal per customer), with an average of 113 g/meal per customer. Nevertheless, all five worksite canteens succeeded in fulfilling their goals by deciding their own strategies at each canteen reaching at end point an average of 181 g/meal per customer, and even higher at the 1-year follow-up (208 g/meal per customer). The 5-year follow-up showed that four canteens still sustained, in different ways, the F&V intervention and that one canteen did not sustain the intervention and almost went back to the baseline. In order to further understand why some of the canteens were more successful than others in sustaining the intervention, qualitative interviews were carried out at all five worksites shortly after the 5-year follow-up measurements. In an upcoming paper, we look more deeply into the differences between the canteens in their ability to sustain the F&V intervention by analysing the data from a social shaping and a worksite policy process perspective.

Several study limitations should be noted. First, no intake data are available at the individual level. The results are based on the total consumption of F&V in the canteens relative to the number of customers. It is possible that the results conceal large variations between customers. Other limitations could be the changes in the meal serving system and the decrease in the number of customers. Most of the canteens had changed the serving system from cash system to buffet. This fact may have contributed to the findings and suggest that the positive results may be due not only to the efforts of the canteen staff but also to changes in the food choice pattern of customers due to the introduction of the *ad libitum* based design of the new serving system. Likewise, changes in the customer base (e.g. more women and more health-conscious customers) may also affect the food choice pattern resulting in healthier food choices and therefore show a sustained or even increased F&V intake per customer per day. A multivariate analysis of the variables (demographic of the employees and the food service systems) would have strengthened the study in order to support or decline the claim that the intervention was sustained at the 5-year follow-up. Furthermore, the sustained F&V consumption could be due to more focus during the past 5 years on healthy eating and on health promotion in general in society.

A major strength of the study is that the sustainability data were obtained exactly 5 years after the intervention at a 3-week period, as in the original intervention, in order to avoid seasonal changes in F&V intake. Furthermore, a 3-week sequential assessment period was chosen to minimise the possibilities of the canteens modifying the meals. In addition, the staff and the management at the canteens were nearly the same as during the intervention, knowing the procedure of the F&V measurements.

In conclusion, the present study indicates that it is possible to sustain F&V interventions at the worksite. The study measured the sustainability of the '6 a day' Worksite Canteen Model study that was based on a participatory and empowering approach, self-monitoring and networking among worksite canteens. This not only increased F&V consumption among employees during the intervention period but also contributed to sustaining this increase over the long term. However, not all worksites were equally successful, indicating that more factors influence the sustainability of an intervention. Some factors influencing the sustainability of the intervention could be commitment of the management, outsourcing of the canteen facility and supportive policies at the worksite. The present study indicates that a worksite intervention needs to be tailored to the needs of the particular worksite environment in which it is implemented.

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Paper 3: Social shaping

Strategies to promote healthier eating at worksites – analysis of experiences from a social shaping perspective

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Draft

Short name: Social shaping

Tables and Figures are placed at the end of the paper after the references

Abstract

Objective: The objective of the study is to analyze long term sustainability of a healthier worksite eating intervention.

Methods: The sustainability of a fruit and vegetable (F&V) intervention is analysed by a social shaping and a worksite policy process approach.

Results: Outsourcing of the food supply and structural changes (like re-structuring) of the worksite may challenge the sustainability but may also be a way of ensuring the necessary competences for a more F&V intensive food supply. Furthermore the engagement of the canteen manager and ability to develop F&V strategies, and good cooperation with F&V suppliers plays important roles.

Conclusions: The study shows that a healthy eating worksite intervention needs to be designed in close partnership with local stakeholders in order to ensure interaction with the conditions at the particular worksite in which it is implemented.

Keywords:

Sustainability of intervention, Worksite canteens, Social shaping approach, Worksite policy process approach

Introduction

A number of diseases and disorders are linked to unhealthy eating and are among the main causes for the growth in overweight and obesity among the adult population[1-4]. In order to fight overweight and obesity there is a strong need for strategies that can help promoting healthy eating. In recent years strategies that focus on promoting healthy eating in settings have received increasing attention[5].

The worksite is an important setting since the worksite reaches a large proportion of the adult population including some unlikely to engage in a preventive health behavior program [5].The settings approach to promoting healthy eating has been growing in importance ever since the Ottawa charter for health promotion was adopted in 1986 [6,7] . However, many health interventions fail to consider the interventions as complex systems that interact dynamically with the key stakeholders and the setting and the broader community [5,8,9,10,].

In a number of countries initiatives and projects has been launched at worksites to promote healthier eating. An international review of interventions aiming at increasing the F&V consumption through interventions at worksites[11] shows that the impact is depending on several factors: Management support, information and training, supporting organisational structures, and employee participation in planning and implementation. Furthermore it is necessary to focus on more factors than the diet, including worksite health and safety, and involvement of employees' social context, likes worksite colleagues and family.

Although healthier eating is a priority in many companies, the implementation of healthier eating should be regarded as an organisational change process with potential conflicting interests. For example there could be disagreement regarding to what extent the worksite should limit unhealthy food choices for employees.

Even though worksite canteens seem to be a promising setting for promoting healthy eating there is limited knowledge on how healthier eating can be promoted and sustained at worksites. This article explores the shaping and the sustainability of initiatives aimed at promoting and implementing healthier eating in worksite settings by analysing the shaping and embedding of interventions of healthier eating in the '6 a day' Danish Canteen Model Study[12]. The analysis is based on a combination of a social shaping perspective and a worksite policy process perspective. The objective of the research reported in this article was to develop a deeper understanding of the sustainability of healthy food promotion interventions at worksite canteens: What are the success factors of sustainability in worksite F&V promotion interventions? And why is an F&V intervention sustained better at some worksites than at others?

Theoretical perspectives on shaping of worksite eating

Healthier eating intervention at worksites are analyzed by a worksite policy process approach to the local shaping of management concepts at worksites, where the concept of F&V intervention is viewed like a policy program, which means the concept is non-neutral and has a preferable way of viewing the organization's future, here higher consumption of F&V. Certain stakeholders are supposed to have particular roles in the change process, and the policy program is based on a coalition of stakeholders negotiating the change process[13].

The model consists of three elements influencing the concept-based intervention: a) the concept (and its measures and tools), b) the context (the worksite and its surroundings and how they operate) and c) the involved internal and external stakeholders (management, external consultants, project leaders, Human Resource professionals, employees, change agent etc.). All these elements influence the intervention as a change process, so by looking into the social and technical dynamics of the intervention the model gives possibilities for analyzing the local shaping of the concept's critical points over time, the barriers and the possibilities for change.

Social constitution as theoretical approach to worksite context and stakeholders

The tradition of critical working life research has inspired the analysis of the changes at the worksites during the shaping and implementation of the F&V intervention. The analyses were inspired by the approach of the worksite's social constitution. This approach was developed by Hildebrandt and Seltz (1989) and is an analytical understanding where social processes at worksites are evaluated through analysis of the worksite's social practice [14].

Social constitution utilises a dialectical relation between local worksite policy and structural power. The basis is the picture of a worksite as subject to the capitalistic mechanisms and thereby an asymmetrical balance of power between the different actor groups at the worksite. Actors are structured in social groups through their position at the worksite (top management, project management, supervisor level, catering staff, employees, etc.) and are thereby also linked in a macro-power structure. The social constitution of a worksite is characterised by a number of variables; among these are the formal power structure of the workplace, the regulation and negotiation system at worksite level, and the conflict and consensus history of the worksite.

Analyzed through this perspective the shaping of healthier eating at a worksite will evolve between, on the one hand, the existing traditions of the worksite, such as local views connected to the practice of the worksite, and, on the other hand, the pressure generated among the stakeholders at the worksite from the need for healthier eating and maybe health promotion in general. This pressure is mediated through both internal actors' (maybe the management support the idea) and external actors' (like external project staff/consultants) formulation and schematization of issues like health, nutrition and healthier eating.

The analyses in the case studies on healthier eating focus on the *shaping* of healthier eating as well as on the *results* of the shaping, like what is left of established opinions, routines, networks, technology etc. Figure 1 shows the social shaping perspective at the time of planning the intervention (T=1) and at the time of the embedding of the intervention (T=2). The figure includes also the interaction with societal changes, like changes in governmental regulation which may take place during the embedding process.

Methods

Qualitative methods are useful in order to understand themes of the daily world from the subjects' own perspective [15]. The case studies are based on qualitative semi-structured interviews with a sample of stakeholders at the five worksites, following a phenomenological approach [15], and analyses of available policies at the worksites, documents regarding the original '6 a day' intervention study, 2006 F&V consumption measurements at the five worksite canteens based on [12,16].

Case study methodology

The analysis of the sustainability of F&V intervention at the five worksites was carried out as multiple case study research with each of the five worksites as separate cases and with multiple units of analysis at each worksite with personal interviews of different stakeholders as the separate units of analysis [17].

Multiple case study research helps to understand the influence of variability of context and to gain more general research results in terms of causes and aspects, which can explain patterns and changes within cases and differences and similarities across cases.

The applied case study research methodology included the following tasks: 1) Determine and define the research questions, 2) Select the cases and determine data gathering and analysis technique, 3) Prepare to collect the data, 4) Collect data in the field, 5) Evaluate and analyze the data.

No selection was made among the involved worksites in the intervention since all five canteens from the intervention were interested in taking part in the study of the long-term sustainability. This implies that the cases had participation in the F&V intervention as common historical events but at the same time the worksites were different with respect to some worksite criteria like public-private worksites, dominating gender, regional location and size. Hereby the sample of cases represents some variation within the overall topic of shaping and embedding of worksite-based F&V intervention.

Multiple sources of data were used covering both qualitative data (personal interviews) and quantitative data (registration of F&V consumption). The interview persons were selected so they represented different stakeholder groups at the worksite with respect to their formal organizational affiliation (worksite management, worksite employees, canteen management and staff).

Based on the data from each worksite a case description was made for each. As data analysis techniques in case studies have been applied [17]: 1) Explanation building, 2) Time-series analysis (by combining with earlier data for F&V consumption), 3) Cross-case analysis.

Interviewing different stakeholders within the single case made them detailed in order to give a good base for cross-case comparison. The explanation building part of the case analyses was based on the earlier described theories for social shaping of concepts and for worksite policy processes.

The five worksites being selected in this study were the same five worksites as earlier studied at the canteen intervention within the '6 a day' program in 2000-2002 [12]**.** The five worksites were: a military base, an electronic component distributor, a bank, a town hall administration and a waste-handling facility.

Two of the five selected worksites were encouraged to participate in the 2000-2002 intervention because there was a wish to study worksites with physically active male employees (the military base and the waste-handling facility). The three other worksites were chosen because the canteen managers themselves made contact with the project and they all satisfied the selection criteria of serving more than 50 but less than 500 meals per day and having facilities to prepare meals in the canteen including handling fruit and vegetables. The worksites should represent different types of working environments (public and private sector and represent diverse company employee groups with respect to sex and sedentary or physically exacting work). Last but not least the canteen managers should be motivated to make changes towards meals containing more F&V[12].

Interviewing procedure

In May to July 2006, shortly after the F&V consumption measurements in then sustainability study [16], 21 semi-structured qualitative interviews were carried out individually with different stakeholders at each of the 5 worksites (the in-house canteen manager or the external caterer, the director of the canteen, a safety representative for the worksite employees and a canteen customer). Each interview lasted between 60 to 90 minutes and focused on themes like motivations to join the intervention project, motivations and barriers for sustaining the F&V consumption since the intervention, interaction with other worksite related matters, and strategies for increasing the consumption of F&V further. The interviews were tape recorded and transcribed. All transcriptions were coded by the interviewer inspired by the combination of the social shaping perspective on concepts and the worksite policy process perspective [13]. Also meaning condensation with respect to selected points was undertaken [15]. Comparative analysis was designed to reveal common traits, variation and differences between the five worksites. The main author did participate in the original intervention study and therefore knew the intervention and the participating canteens and worksites very well. By interviewing, the interviewer herself is the main instrument for obtaining knowledge and the interview is part of the analysis as a social interaction between the interviewer and the interviewee [15]. Furthermore the project concept might influence the perception of healthier eating at the worksite of different actors at the worksite. This interaction, including the reflection of the actors about their own role, is important to be aware of and understand as part of the analysis of the shaping of healthier eating [18,19].

When the main author went back to the canteens and conducted the interviews it demanded a balance between keeping distance and having proximity. The main author was aware of this double role and the co-author kept a critical view upon the data and the analyses in order to reduce bias.

Results

The following themes were included in the analyses of the shaping and embedding at each of the five worksites: 1) the F&V strategies and the meal service system, 2) the customers 3) the canteen staff and canteen manager and their perception of healthy eating and their motivation and self-efficacy, 4) the management and their perception of healthy eating, 5) the worksite (changes during the F&V intervention and afterward, history, working conditions, different policies etc), and 6) The roles of the project team (internal and external change agents).

In the following the five cases are analyzed one by one and afterwards the different themes are analyzed across the five worksites in order to get a deeper understanding of the sustainability of the F&V intervention and why it is sustained better at some worksites than at others.

Case 1 (the military base)

The worksite is a public, male dominated worksite, with a majority of younger men. The military base has two different types of employees, the stationary employees and the young soldiers only staying for 4 months. The worksite has changed since the intervention having fewer employees and a different organizational structure. The canteen is financially supported but to a lesser extent than the other worksites. The canteen was modernized after the intervention and now has a bigger area for self-service for the customers, making the line work faster, but kept the cash paying system. The canteen manager did not participate in the preparation of meals, neither before nor after the intervention.

The baseline showed that the canteen had the lowest F&V consumption (70g/meal/customer) of the five worksites but during the intervention the F&V intake increased to 147 g/meal/customer. The F&V strategies being used were: adding F&V to the stews and casseroles and introducing vegetarian meals once a week, while mixed rich salads and free peeled carrots were offered daily. The canteen informed the employees about the intervention.

In 2006 the F&V intake was almost back to the baseline. The strategies regarding F&V in the hot dishes were sustained to some degree; twice the amount from baseline, but only half of the amount at the 1 year follow-up. The F&V in the salad bar was almost back to the baseline and the F&V in the sandwich decreased to less the amount of F&V at the baseline. There was no longer offered free carrots at the canteens.

The F&V intervention had not been sustained at the worksite. The canteen manager at the worksite was still the same dedicated person, but all his efforts went towards a request for proposal to contract out the business and not towards keeping focus on F&V in the meals. The worksite did experience some uncertainty regarding the organization during the last years. Furthermore part of the staff, for example the cooks/chefs at the canteen changed and the recent ones had less focus on F&V in the meals.

Case 2 (Electronic component distributor)

This worksite is a private male dominated worksite, also with a majority of younger men. After the intervention the worksite moved and downsized. In 2006 the canteen

manager was the same dedicated and personally motivated person, silently supported by the management. The canteen is financially supported by the worksite.

The canteen at baseline already had the highest F&V consumption of the five canteens since the canteen manager also before the intervention focused on healthy food with a lot of F&V (168 g/meal/customer). The F&V strategies during the intervention focused on seasonal variations in the hot meals as well as the cold dishes, F&V supplements on the plates with the meat products for the open sandwiches, mixed appealing salads and peeled carrots. The F&V intake in 2006 increased to a significant higher level than at the intervention (312 g/meal/customer). Especially F&V in the hot dishes, in sandwiches and F&V snack increased. F&V in the salad bar was maintained from baseline at a high level. The F&V strategies were maintained from the intervention, but new ideas keep emerging like take away meals once a week. Some customers complained about eating too much from the buffet and gaining weight. Therefore the canteen manager had an idea to teach the customers about portion sizes by having plates on display showing 3 different portions; small, medium and big, depending on your size and your physical activity level.

Ever since the intervention the canteen on occasions still monitored the F&V consumption to evaluate their goals. The canteen staff liked to be creative and serve for example a changing variation of mixed salads, while some customers prefer to mix salads themselves. According to the canteen manager it is a constant struggle to keep focused on serving healthy meals. The employees are fewer and younger than before which has challenged the practice of the canteen serving meals with a high amount of F&V. The canteen manager acknowledged that some customers are hard to reach; especially the younger ones and sometimes she compromised in order to reach them, by having boxes with not mixed F&V at the salad bar in addition to mixed salads. The canteen manager decided to wait informing the customers about the F&V intervention until 3 months after the intervention. She wanted to persuade the customers by means of delicious meals.

Case 3 (the bank)

The worksite is a private, female dominated worksite, with a majority of women above 40 years. The management supported the F&V intervention that suited the healthy profile the worksite wanted, so the intervention was considered a support to the canteen during the change process.

The employees were informed about the intervention and the canteen was portrayed several times in internal journals. The canteen was outsourced after the intervention took place, but the canteen manager and some of the staff were the same as under

the intervention. New suppliers and new routines had been introduced. The worksite still supported the outsourced canteen financially, but to a lesser extent than before the outsourcing.

The baseline showed that the canteen had an average F&V intake at 112 g/meal/customer. During the intervention the strategies focused on more F&V in the hot meals or a side meal and F&V as snacks were upgraded. During the process of outsourcing the meals, routines and policies were agreed upon in a plan for contracting out the business. The canteen staff was employed at the bank before the outsourcing and after contracting out the business the staff became employed by the caterer. The canteen kept its focus on F&V but the monitoring of the F&V consumption stopped after the outsourcing. Having an external caterer with new suppliers and new handling rules influenced the assortment and the quality of the meals, e.g. pre-washed and pre-cut F&V from the new supplier had worse quality. Some customers and also the canteen manager commented on the food quality and preferred the meals from before the contracting out the business. The intervention was sustained by keeping the focus on F&V in the hot meals and by keeping the salad bar with mixed salads as well as not mixed F&V. A small but not significant decrease was seen in the 2006 F&V consumption measurements due to a decrease in the F&V snack.

Case 4 (the town hall)

The worksite is a public female dominated worksite, with a majority of women above 40 years. The worksite changed since the intervention took place. The profile of the employees changed towards younger and more health oriented customers. Also two public policies have been approved for all the municipal worksite canteens: a nutrition policy including the use of organic products, and a health policy. At the time when the original canteen study took place it fitted perfectly for the canteen to participate in the F&V intervention since the canteen at that period was in the process of changing from conventional products to organic products. And since the organic products are more expensive, especially meat, the canteen needed to focus on preparing meals containing more F&V. The canteen is financially supported by the municipality since organic products are more expensive than conventional and more time consuming to use since only very few organic products are processed.

The baseline showed that the canteen had an average F&V consumption of the five worksites (118 g/meal/customer). During the intervention the canteen focused on more F&V in the hot meals and in the cold dishes by making prepared cold plates including 200 g F&V on every plate and sandwich with 150g F&V. The 2006 F&V measurements showed that the intervention was sustained and embedded at the canteen by focusing on F&V in the hot meals, F&V in the salad bar (more than twice

the consumption from the baseline), F&V snack and also F&V in the cold dishes but less than under the intervention. Furthermore, serving organic meals supported seasonal meals rich in F&V since organic meat is very expensive.

The meal service system changed during the intervention from a cash system to a buffet service system. Also the kitchen facilities were improved during the intervention making it easier to handle the fresh F&V being used in the organic meals.

During the intervention the customers were skeptical at the beginning but were persuaded through information letters, posters, by tasting meals, and by demonstrate plates.

Case 5 (the waste-handling facility)

The worksite is a semi-public male dominated worksite, with a majority of men above 40 years. The canteen joined the F&V intervention because the worksite joined another health promotion intervention having focus on physical activity, smoke cessation, courses on health promotion and healthy eating. Therefore the F&V intervention fitted perfectly to the worksite's policy on health promotion. The baseline showed that the canteen almost had an average F&V consumption at 99 g/meal/customer. The canteen focused during the intervention on the cold dishes and especially on peeled carrots and once a week old fashioned hot meals with a lot of F&V. After the intervention the canteen was outsourced to an external caterer, keeping the canteen staff to serve the buffet with the catered food. The meal service system changed from cash to a buffet. The management supported the healthy food and the canteen is financially supported by the worksite.

The 2006 F&V measurements showed that the increased F&V consumption was sustained and embedded at the canteen. The F&V strategies in 2006 focused on F&V in the hot meals and on a salad buffet with mixed salads as well as not mixed F&V. The buffet serving system made it easier to include more F&V into the meals than before the intervention and the external caterer had focus on seasonal F&V and on serving mixed salads and hot meals with a lot of F&V. In 2006 the canteen served hot dishes, cold dishes, salad bar every day, while during the intervention the canteen only once weekly served hot meals. Some employees preferred the cold sandwiches and the more old fashioned style hot meals from before the external caterer took over. Also some customers complained about eating too much from the buffet and gaining weight. The external caterer acknowledged the problem about overeating when changing from a cash serving system to a buffet serving system.

Discussion

Organizations may vary in the extent to which the pre-existing structures and processes are able to facilitate organizational change to promote and sustain health related initiatives [9, 20]. Consequently it's crucial to identify and address barriers to and enhance facilitators of organizational and environmental changes within worksites [11]. The themes of the five cases in the present study were analyzed across the worksites in order to understand why the F&V intervention was sustained better at some worksites than at others. The characteristics of the worksites and the intervention are shown in Table 1. Figure 2 shows the F&V consumption from baseline, end-point and at 1 year and 5 year follow-up. The F&V consumption at the 5y follow-up showed that 4 canteens still sustained the F&V intervention, whereof the consumption at one of the worksites even increased further during the embedding (the electronic component), and that one canteen (the military base) failed to sustain the intervention and almost went back to baseline. The 5y follow-up showed big differences in between the five worksites regarding F&V consumption (87, 312, 178, 223 and 240 g/meal/customer[16]. In the following, the identified topics from the case studies are discussed across the cases within the six themes, which the case studies focused on.

The role of the F&V strategies and the consumption of fruit and vegetables

The staff and canteen managers at the five worksites developed their own F&V strategies inspired by the '6 a day'-project coordinators and the intervention was thereby modified to fit into the specific worksite and the social context of the worksite. The F&V strategies concerning hot meals seemed to be the most successful to sustain and the strategies that gave the most F&V per meal (50, 99, 72, 76 and 115g/meal/customer). The hot meals strategies being adding F&V to stews and casseroles, vegetarian meals once to twice weekly and focus on the seasonal F&V, 3-4 time a week focus on adding extra amount of F&V. The salad bar was also successfully sustained at four of the canteens (60 to 100 g/meal/customer). The F&V strategies being used at the canteens were mixing rich and appetizing salads including coarse vegetables, meat and fish, not mixed greens and sliced fruit. Also placing salads at different places at the buffet to reach non-salad eaters seemed to be a successful strategy. The cold dishes did not add much F&V to the total F&V intake/meal and also seemed harder to sustain (11 to 32 g/meal/customer). Only the electronic component increased the amount to 68 g/meal/customer. The F&V strategies included focus on seasonal F&V, dense vegetables as garnish, replacing meat with vegetable fillings.

Finally the F&V snack only added from 11 to 23 g/meal/customer except for the electronic component distributor that added 55 g/meal/customer. The strategies here were sliced F&V, a snack bar, fruit dessert and bags with F&V.

Especially the staff at the electronic computer canteen had been creative and innovative in their F&V strategies in between the intervention and the 5y follow-up, e.g. a grandmother's day with old-fashioned meals, a canteen take away day and a surprise day.

Between the intervention and the 5y follow-up two of the canteens continued monitoring the F&V intake in order to check their F&V performances (the electronic component distributor and the bank until being outsourced). Interviews with the canteen managers after the intervention showed that monitoring the F&V was very useful because it showed clearly and instantly which strategies worked well and which did not. So even though monitoring was some what burdensome for the staff it also kept the staff focused on fulfilling their F&V goals [21,22]. Also the military base did, during the intervention, measure the F&V intake on a regularly basis in order to check their performance, but the monitoring was skipped after the intervention period like in two other canteens (town hall and waste handling).

The role of the meal serving system

A buffet meal service system might be better in order to sustain the healthy eating intervention compared to the cash system. Lassen et al [23] showed in a comparison study of meals from 15 canteens that eating at canteens serving buffet style was associated with an increase in F&V and a lower energy density of food for both genders. Another advantage of a buffet system is that the customers are more tempted to try something new, several canteen managers commented [22]. This might be a drawback for the military base having a cash system. Furthermore the military base only had limited corporate financial support that could challenge the availability of healthy meals since canteens being subsidized had significant higher frequency of healthy meal options [24].

From the interviews at the 5y follow-up the customers at two worksites (the waste handling facility and the electronic component) complained about eating too much and gaining weight. Some customers maybe had a problem getting adjusted to the buffet system and therefore ate too much and gained weight. Another problem might be customers' perception of portion size; people have to adjust their eating to their physical activity level and their nutritional needs. One canteen served cold dishes containing a fixed amount of 200 g F&V and sandwich with 150 g F&V in order to teach the customers about the amounts of 150-200 g F&V (the town hall).

The role of the canteen staff and canteen manager

The canteen staff and canteen managers were almost identical at the 5 y follow-up compared to the baseline. The canteen managers were all selected to the intervention because they were motivated for participating in an F&V intervention. At the 5y follow-up the canteen managers were still motivated. However, the conditions for running a canteen had changed at three of the worksites: one (the bank) was outsourced and another (the waste handling) got an external caterer and the military base had a request to contract out the business.

In order to create staff involvement at the F&V intervention the staff and canteen managers were asked to decide locally at the canteen on the goals and the F&V strategies. Everyone in the canteen participated in kick-off seminar, team-building and educational sessions, goal setting and deciding on F&V strategies [12]. Neither at the military base nor at the bank the initial motivation to join the project among the staff was as high as at the other 3 canteens. During the intervention the approach of most staff changed and they took ownership for the intervention [22].

Among the canteen managers and the staff the customers were regarded to be barriers to serve healthy meals, but a customers' survey showed that in general the customers at all five worksites were positive against meals containing a lot of F&V [25].

The cooks and the staff at the military base did occasionally take turns at different military bases. The chefs in 2006 were not interested in F&V and therefore focus shifted away from F&V in the meals. Since the canteen manager did not participate in the meal preparation he didn't notice and seemed surprised when he experienced the decrease in F&V. Even though the canteen manager was still motivated for F&V promotion intervention at the worksite and he had worked at a policy paper for ensuring healthy meals at the worksite he forgot to ensure sustainability of the F&V intervention at his own canteen.

It is very important to the success of the intervention to have a motivated canteen manager with the ability to develop strategies for integration of more F&V in the food supply and good cooperation with the F&V suppliers. The canteen manager at the electronic component was very motivated and succeeded in increasing the F&V consumption without management support. As time went on she convinced not only the management but most of the employees at the worksite by being very creative in the ways F&V was integrated in the food.

The worksite management and their perception of healthy eating

Management support to the canteen differentiated from acceptance and silent support (the military base and the electronic component) to support (the bank and the town hall) to being the driver of the change process (the waste handling). At the bank and at the town hall the F&V intervention fitted perfectly well to the policies at the worksite and therefore the managements were supportive the whole time but also the canteen managers were motivated for conducting the F&V change process. At the military base the management support was lacking and the F&V intervention was not sustained. At the electronic component the canteen manager only had a silent management support but never the less increased the F&V consumption. This shows that active management support is not a condition for increased F&V consumption, but lack of active support may threaten the embedding if canteen staff is not motivated like the cooks (staff) working at the military canteen during the recent part of the embedding period at the military base.

Structural changes of the worksite, like re-structuring, may also challenge the sustainability of an intervention if this implies frequent changes of worksite employees and new employees question the F&V intensive food supply, like at the electronic component worksite, where the F&V intervention never the less was very successful.

Regarding corporate financial support, all worksites were being supported, e.g. staff salaries, inventory and food products, but to a different degree. The military base to a lesser extent than the other four. All five canteens had to balance their budgets, but the canteens at the four worksites were considered as part of the employee benefits while the canteen at the military base was considered a business. A questionnaire survey among worksite canteens shows corporate financial support of the canteen play a role, canteens being subsidized had significant higher frequency of healthy meal options [24].

The role of the worksite policies

Having a policy regarding smoking or drinking alcohol are more common at Danish worksites than having a nutrition policy [26]. In a questionnaire survey of Danish worksite canteens only 23% of the canteens had a nutrition policy and having that seemed to affect the availability of healthy meal options but only in regard to sandwiches [25]. In this study all five worksites had policies concerning smoking and alcohol, and two of the worksites had a nutrition policy (the town hall and the electronic); three had nutritional recommended guidelines that were comparable to a nutrition policy (the military base, the bank and the waste handling facility). The town hall furthermore had a public health policy and a policy about being environmentally sustainable by using organic products which had synergetic effects on the

consumption of F&V because organic meat is expensive compared to conventional meat. At the bank and at the town hall the F&V intervention fitted perfectly well to the policies at the worksite. The experience from the electronic component worksite shows that a nutrition policy is not necessary to obtain a high F&V consumption since the worksite only recently approved the nutrition policy after longtime pressure from the canteen manager. However, the nutrition policy was seen by the canteen manager as a possible, maybe mainly symbolic, tool to convince critical customers, because there was a frequent change of employees at the worksite.

The role of outsourcing of canteens

In a questionnaire survey 25 % of the canteens were outsourced to catering businesses and ran by an external caterer, while 75% were run by the worksite and therefore in-house [27]. Three of the 5 worksite canteens in the present study were either outsourced, having an external caterer or having a request for proposal to contract out the business. Outsourcing of a canteen might challenge the sustainability of a healthy eating intervention (the military base and the bank) but it also might also help sustaining an F&V intervention (the waste-handling facility) depending on several factors like management and corporate financial support.

The role of the internal and external project teams

The canteen managers acted as internal change agents and some were supported by the management (the bank and the waste handling). The all had their own way of dealing with the project and the F&V intervention, the staff, the customers and the management.

At the beginning of the project the external change agents contacted three F&V experienced canteen managers that acted as role models and ambassadors towards the canteen managers and as advisory boards towards the external change agents in the project. Throughout the project they were used to talk to the participating canteens about their own experiences from their canteens and how they coped with focus on F&V in the meals, the contact with the customers, problems with the staff, the managements etc.

The external change agents focused on supporting the canteen managers at the local worksites because they were found to be the most important stakeholder. In a qualitative interview study being conducted prior to the '6 a day' study the staff, the canteen managers and the management were themselves found to be part of the barriers towards changing the meals to healthier meals containing more F&V [21]. Therefore the support consisted of setting up different network groups, doing team building courses for the staff, the change agents and the canteen managers

themselves, having a newsletter set up with experiences from all five worksites, and helping with contact to the media.

Conclusion and recommendations

The current study shows that a worksite intervention needs to be tailored to the needs of the particular worksite in which it is implemented. Furthermore this tailoring needs to be done in close partnership with the local stakeholders.

However, the analysis of the qualitative data shows that the intervention and its embedding seem to be shaped in different directions depending on the local context for example with respect to whether the canteen is run by the worksite or by an external caterer. Also the concrete strategies for increasing F&V consumption differ from worksite to worksite.

The measurements of F&V consumption at the five worksites showed that four of the five worksites sustained the F&V intervention, and one of the worksites even increased the F&V consumption during the embedding. The military base did not sustain the F&V intervention and almost went back to the baseline F&V intake. The military base differed from the other worksites in several ways: the canteen had limited financial support from the worksite and furthermore the canteen had a request for proposal to contract out the business that required a lot of attention from the canteen manager. Also the meal service system, a cash system, was different from the four other canteens having a buffet system and furthermore the canteen manager did not participate in the meal preparation and therefore did not support the focus on F&V in the meals. Having a cash service system and limited financial support both might have influenced the F&V in a negative direction[23,24] .

Three of the worksites sustaining the F&V consumption differed with respect to the way the canteen was organized in-house (the town hall), outsourced (the bank) or an external caterer (the waste handling). All three worksites had management support and different policies or guidelines supporting the health promotion at the worksite. The waste handling had a management deciding on healthy food options and on an external caterer and the change process was characterized by as a top down process. The bank and the town hall both had a majority of female employees over 40 years. Worksites with a majority of female employees more often have healthy meals available than male dominated worksites [24].

The worksite increasing the F&V intervention the most was the electronic component distributor. The canteen only had silent management support compared to the other three canteens where the F&V intervention was sustained. The outstanding feature at this worksite was an extremely dedicated canteen manager that succeeded in persuading not only the customers but eventually also the management silently supporting the canteen manager.

The change concept developed during the '6 a day' canteen intervention focused on co-operation between a consultant and the local canteen personnel and worksite management in defining, planning and implementing the F&V-intervention.

The novelty value of the present study lies in the analysis of the embedding of an intervention with involvement of the canteen staff already in the initial steps of the intervention. In the initial steps the canteen staff was asked to customize the monitoring procedure of F&V amounts, to set their *own* goals and to develop F&V strategies in the four categories (hot dishes, cold dishes, salad bar and F&V snacks). The intervention acknowledges that for both the intervention components and outcome measurements to make sense they must be embedded deeply in the daily routines of the staff at the canteen.

Healthier eating interventions are shaped and controlled by the involved local actors' ideas of health and nutrition. E.g. the canteen manager at the electronic computer distributor had an idea of serving healthy meals and persuaded not only most employees but eventually also the management. Furthermore she had an idea of serving mixed salads and not F&V separate. At the 5 y follow-up she served F&V separated as well as mixed salad because it was too hard to reach some of the more conservative customers. The results also indicate that there is no single best recipe for an intervention. Interventions cannot be rolled out at worksites according to a uniform concept, but should be shaped to suit the local needs depending on the social constitution of the worksite. Results also indicate that worksite canteens are important change agents in developing and sustaining intervention components within healthier eating. Furthermore the results show how embedding of a healthy food intervention demands an on-going interaction between the canteen and other worksite actors.

The combination of the social shaping and worksite policy process perspectives on worksite interventions is important to be aware of when planning and analyzing organizational changes, such as promoting healthier eating. We suggest this combined perspective as a model for future interventions. This implies that the planning and reflection of the intervention should include awareness around important norms and values at the worksite, and former and ongoing cooperation and conflicts

among employees and management. The case studies did not identify negative interaction with health safety activities at the worksites, which indicates that the intervention has not been used as a substitute to improved working conditions. The problems which some employees had at the some worksites had with gaining weight when eating too much when the canteen food becomes more interesting could indicate a need in future interventions for focus on portion size and the energy intensity of the food in combination with the physical energy, which the work demands. The results of the interventions were obtained despite the social of the employees, like worksite colleagues and family were not directly given a role in the intervention, although a focus on this is seen as important by Sorensen et al [11]. Worksite colleagues may be given a role in discussing the food intake with colleagues, but the intervention may get an element of direct social control, which may be in contradiction of the local worksite social constitution.

Potential limitations to the study need to be addressed. The sustained F&V consumption seen at the five worksites could be due to more focus during the last 5 years on healthier eating and on health promotion in general in society. However, the changes in the F&V consumption took place in close connection to the intervention process, which indicates the possible connection to the intervention. The embedding at four out of five worksites indicates that the successful embedding may have been influenced by the increased societal focus on healthier eating and the role of F&V, although this increased focus is not implying that F&V consumption is in focus at all worksites [26]. The main author went back to the canteens and conducted the interviews, which demanded a balance between keeping distance and having proximity. The main author was aware of this double role and furthermore the co-author kept a critical view upon the data and took part in the discussion of the results.

The study strength is that the reliability of the present study is believed to be good as different sources of data collection was undertaken; observations were made in the canteens, different relevant policies at the worksites were studied and qualitative interviews were conducted as an explanation to the quantitative F&V consumption measurements. Further research could be done in this area to gain a deeper and broader understanding of the social shaping perspective and the worksite policy process perspective in the development of health promotion interventions at worksite settings. A deeper understanding could come from more detailed studies of the case worksites, for example with respect to differences in individual F&V consumption patterns. Furthermore a broader understanding could be obtained by analyzing and comparing the results to worksites which have not been part of specific intervention programs like '6 a day'.

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Author contributions: AVTH and MSJ designed the study and the interview guide. AVTH carried out the study and analyzed the data. AVTH and MSJ discussed the study results. AVTH drafted the manuscript. MSJ critically revised the drafted manuscript and kept a critical eye on the results to ensure an independent perspective on the results.

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Table 1. Characteristics of the five worksites, canteens and the interventions in 2006

Worksite	**Military base**	**Electronic Computer**	**Bank**	**Town hall**	**Waste-handling**
Intervention	Decreased	Increased	Sustained	Sustained	Sustained
Canteen in-house or outsourced	Request for proposal to contract out canteen	In-house	Out-sourced	In-house	External caterer
Meal Service system	Cash	Buffet	Buffet	Buffet	Buffet
Canteen manager's	Dedicated but doesn't participate	Dedicated and participate in	Dedicated and partly participate in	Dedicated and participate in	Less dedicated and participate
Management support	Acceptance	Silent acceptance	Yes	Yes	Yes
Corporate financial support	Limited	Yes	Yes	Yes	Yes
Nutrition policy	Standard meal	Yes recently	Guidelines	Yes	Guidelines
Other policies	Smoke, alcohol	Smoke alcohol	Smoke alcohol	Smoke alcohol health organic policy	Smoke, alcohol
Type of change process	Bottom-up	Bottom-up	Bottom-up and top-down	Bottom-up and top-down	Top-down
Public/private	Public	Private	Private	Public	Semi public
Characteristic of average employee	Male under 40 active	Male, under 40 sedentary	Female, over 40 sedentary	Female over 40 sedentary	Male over 40 active

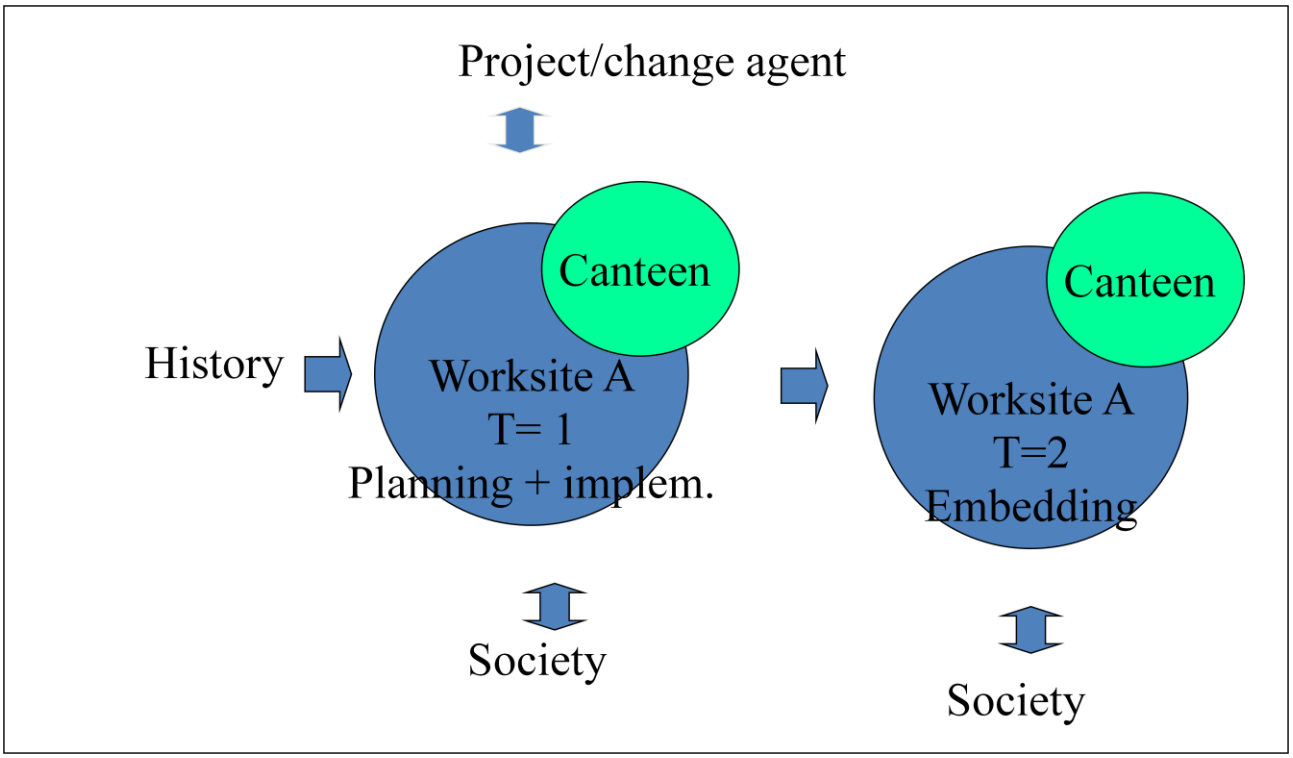

Figure 1 shows the combination of the social shaping perspective and the worksite policy process perspective at the time of planning the intervention (T=1) and at the time of the embedding of the intervention (T=2). The figure includes also the interaction with societal changes, like changes in governmental regulation.

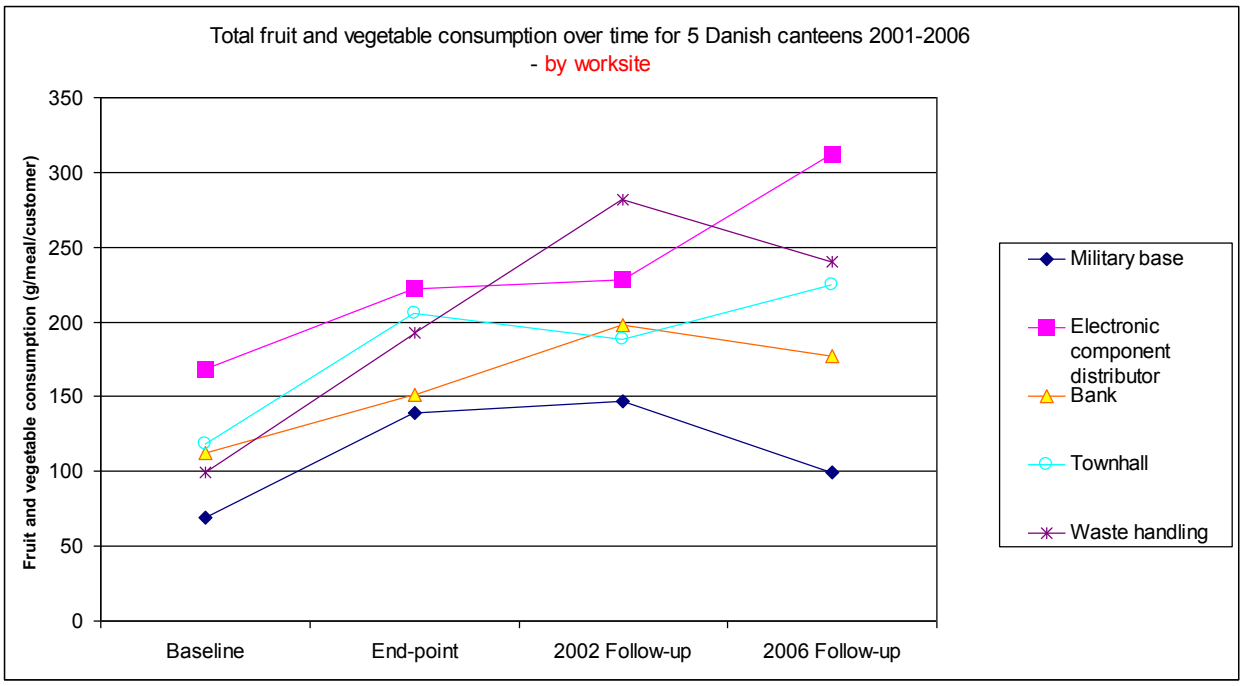

Figure 2. The average F&V consumption at the five different worksites measured before the intervention (baseline) in January-February 2001, after the intervention (end-point) in September-October 2001, at the 1 year follow-up in January-February 2002 and at 5 year follow-up January- February of 2006. The measurements at the baseline, at the end-point and at the short-time follow-up are all reported in Lasssen et al, 2004 and in Thorsen et al, 2010. The 5 year follow-up are reported in Thorsen et al, 2010.

Appendices

Appendix A

Appendix A contains the interview guide to worksite employees and canteen managers in the case studies analysed in Paper 3.

The Canteen

As a starting point the new measurements are shown and then the focus is returned to the project in 2001.

The new measurements of fruit and vegetables, five years after project "six a day".

-Do you have any comments on the measurements?

Have you used the information material from '6 a day' in your work? How?

During project '6 a day' your kitchen decided to work with the following objective … and you decided to concretely work with the following initiatives to be able to achieve your objective.

The initiatives were as follows …

Questions concerning the individual initiative: ask concretely

What has become of the "old" planned initiatives?

Has it been introduced?

Has it been maintained?

Has it been adjusted?

What has it meant for the consumption of fruit and vegetables?

For each individual introduced initiative the following is asked in order to throw light on how an initiative is implemented and what is has required:

- Separate the initiatives and ask after the individual parts.
- Changes in work routines? Recipes? New equipment?
- Changes in connection with shopping? New goods/products? New supplier?
- Use of peeled/shredded/pre-prepared vegetables? Which?
- Impact on the finances (time spent, shopping etc.)?
- Difficulties in connection with the implementation of the initiative?
- Inspiration, from where
- Other things of interest

Has there been taken new measures? In which direction is the canteen headed? Is "fruit and vegetables" being rethought?

Does the canteen have a new objective or is the old objective still in use (5 years after)?

Other changes at the canteen?

- New address, new customers, new manager/management/department?
- New suppliers?
- Less customers because of fewer employees in the company
- Other changes in the canteen/company that is of significance for the canteens range of fruit and vegetables.

Notes: Which part does … play?

- Salad-bar
- Cooked vegetables for the hot dish

- Vegetables for the cold part
- Fruit and snack-greens

Did the participation in project '6 a day' create a change in the canteen's relations to the rest of the company?

Did the canteen get a stronger/weaker position, more central/peripheral position?

Has the canteen participated in other healthiness-promotional-projects since project '6 a day'?

Does the promotion of healthiness play a part in the company today?

How has the support been among the canteen-personnel?

- During project '6 a day'?
- And since then?
- And in the event of participation in other projects?

How have the reactions been from users/customers?

- During project '6 a day'?
- And since then?
- And in the event of participation in other projects?

How have the reactions been from the management?

- During project '6 a day'?
- And since then?
- And in the event of participation in other projects?

What has been exciting / tiresome (difficult/easy) to work with?
Has there been something that has been particularly exciting (and/or tiresome) to work with. (Perhaps also ask the employee this). Something that is different?

Has the project yielded new contacts/collaborators (internally and externally)?

How do you see the canteen in for instance 5 years?

- What do you emphasize?
- What is different?
- What has been maintained?

What do you understand by healthiness?

- Have you yourself become healthier?
- Do people talk about healthiness in the company, and if so how?

Comments otherwise on participating in the project and on the follow-up measurements?

Internally at the company

Same questions to the management and employee representative. Some questions are repetitions of questions asked to the canteen-manager to investigate if the perception of the problem statement in question is the same/different.

Were management/the employees informed of the canteen's participation in project '6 a day'? If yes, did management support the canteen's decision or was it a decision the management did not intervene in?

- How was management informed of the project?
- Did you (THEY?) have any reservations about participating in the project?

Has healthy food and eating habits become an integrated part of when the company decides on the employees'

- Job satisfaction (perk)?
- Healthiness?
- Work environment?

Did the participation in project '6 a day' create a change in the canteen's relations to the rest of the company? Did the canteen get a stronger/weaker position, more central/peripheral position?

How have the reactions been from the users/customers in the canteen?

- During project '6 a day'?
- And since?
- And in the event of participation in other projects?

Specifically for the canteen-food

- Do you yourself eat at the canteen?
- Stance on the food and favorite dishes/ dishes you do not like

About the promotion of Healthiness in General

Is the company interested in promoting the healthiness of the employees?
At first the questions asked are open and then the questions are asked on more specific areas

- Why is the promotion of healthiness (not) worked at?
- Who works with it? And in which manner?
- Are resources, time or money set aside for it?
- Does management follow up on the activities in progress?
- Are the following areas worked at
  - Healthy food
  - Better work-environment. Which aspects?
  - Flexible working hours
  - Prohibition of smoking; help to quit smoking

    - Better possibilities of exercise at the company/during working hours
- How do you believe persistent healthiness-promotional changes can be made at the company?

Has the company participated in other projects about the promotion of healthiness after '6 a day'?

- Which projects?
- Why, why not?

Is healthy food included as a part of objectives, policies etc (e.g. diet-policies, healthiness-policies, "iso-certificates" etc.)?

Have new policies been drawn up for food, smoking, alcohol or something else as regards the promotion of healthiness?

- If yes, who has started it and what is started?
- If no, why do you believe it is so?

Management's and the employees' stance on the company's policies

- Are there changes or initiatives that have been opposed?
- What has happened to these initiatives?
- What is the stance on
    - Eating healthy?
    - Exercising?
    - Smoking?
    - Work environment?
    - Stress?

- Have there been changes in the stance during the last 5 years?

- How do the employees regard the company intervening in what the employees eat? *(Paternalism?)*

- In what way, if at all, has it been intimated that the fear of healthiness-promotion means the individualization of the responsibility for healthiness?

The challenge of public health nutrition in relation to worksite settings is to improve access to healthier meal options. Strategies changing the dietary environment such as increasing the availability of healthy food and reducing barriers towards healthy eating may help consumers change dietary behavior and meet the guidelines for a healthy diet.

The overall purpose of this Ph. D. thesis is to make a contribution to promote healthy eating in worksite settings by developing a deeper understanding of the sustainability of healthy food interventions at worksite canteens. This thesis analyses the 5 year sustainability of an intervention at five worksites aiming at increasing the consumption of fruits and vegetables. The thesis is based on a combination of social shaping and worksite policy process perspectives as a framework for understanding sustainable interventions.

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